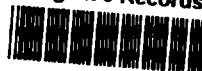


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EPA Region 5 Records Ctr.



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AMENDED RECORD OF DECISION

**HIMCO DUMP
ELKHART, INDIANA**

U.S. Environmental Protection Agency
Region 5
Chicago, Illinois

AMENDED RECORD OF DECISION HIMCO DUMP

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ACRONYMS AND ABBREVIATIONS

ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
BEHP	Bis(2-ethylhexyl)phthalate
bgs	Below ground surface
BRA	Baseline Risk Assessment
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
°C	Degrees Celsius
CDA	Construction Debris Area
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CGI	Combustible Gas Indicator
CLP	Contract Laboratory Program
COPC	Constituents of Potential Concern
CRL	Central Regional Laboratory
CRQL	Contract-Required Quantitation Limit
CSM	Conceptual Site Model
CT	Central Tendency
DO	Dissolved Oxygen
EA	Eastern Off-Site Residential Area
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
eV	Electron Volt
FIT	Field Investigation Team
FS	Feasibility Study
FSP	Field Sampling Plan
GAF	Gastrointestinal Absorption Factor
gpm	Gallons per Minute
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
Himco	Himco Dump Superfund Site
HQ	Hazard Quotient
IAC	Indiana Administrative Code
IC	Institutional Control
IDEM	Indiana Department of Environmental Management
IEUBK	Integrated Exposure Uptake Biokinetic
ILCR	Integrated Lifetime Cancer Risk
IRIS	Integrated Risk Information System
ISBH	Indiana State Board of Health
K _{ow}	Octanol/Water Partition Coefficient
K _p	Permeability Coefficient
LEL	Lower Explosive Limit
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
mL	Milliliter
ml/min	Milliliter per Minute

MSL	Mean Sea Level
NCP	National Contingency Plan
ng	Nanograms
NPL	National Priorities List
NTU	Nephelometric Turbidity Unit
ORP	Oxidation/Reduction Potential
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PEF	Particulate Emission Factor
PID	Photoionization Detector
ppm	Parts per Million
PRG	Preliminary Remediation Goal
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAGS	Risk Assessment Guidance for Superfund
RAOs	Remedial Action Objectives
RAS	Routine Analytical Services
RBSL	Risk-Based Screening Level
RCRA	Resource Conservation Recovery Act
RD	Remedial Design
RDA	Recommended Daily Allowance
RfD	Reference Dose
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD-A	Record of Decision Amendment
SARA	Superfund Amendments and Reauthorization Act
SOW	Statement of Work
SQL	Sample Quantitation Limit
SRA	Supplemental Risk Assessment
SSI/SCR	Supplemental Site Investigation/Site Characterization Report
SSL	Soil Screening Level
SVOC	Semi volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TIC	Tentatively Identified Compound
TOC	Total Organic Carbon
µg/kg	Micrograms per Kilogram
µg/l	Micrograms per Liter
µg/m ³	Micrograms per Cubic Meter
µs/cm	Microsiemens per Centimeter
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
VOC	Volatile Organic Compound

PART I

RECORD OF DECISION AMENDMENT HIMCO DUMP SUPERFUND SITE DECLARATION

1.1 Site Name and Location

Himco Dump Site
City of Elkhart, Elkhart County, Indiana 46516
CERCLA Identification Number IND980500292

1.2 Statement of Basis and Purpose

This decision document proposes a modification to the selected remedial action for the Himco Dump Superfund Site, Elkhart, Indiana, which was chosen on September 30, 1993, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision to propose a change in the remedy is based on the updated administrative record for this site.

1.3 Assessment of the Site

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision Amendment (ROD-A), may present an imminent and substantial endangerment to public health, welfare, or the environment.

1.4 Description of the Proposed Amended Remedy

EPA proposes to amend the 1993 ROD to modify the landfill composite cap design, provide a municipal water supply connection to 39 residents located east of the landfill, and to establish a contingency for further groundwater containment and remediation. The purpose of this remedy is to eliminate or reduce the risks associated with exposure to the contaminated soil and groundwater associated with the former unlicensed landfill. To remove the potential threat to human health, the selected remedy will remove the affected receptor, the residents living east of the landfill from the groundwater pathway by providing an alternative water supply. These residents living east of Himco Dump (21 selected and 18 buffer zone residents for a total of 39) will be connected to the local municipal water supply and their private water wells abandoned per 312 Indiana Administrative Code (IAC) 13-10-2. To remove the potential threat from groundwater to human health for the residents living adjacent to the Construction Debris Area (CDA) south of the landfill, all residents previously supplied with municipal water (1991) will have their private water wells abandoned per 312 IAC 13-10-2. For the surface of the CDA, remove all construction debris and rubble; and for the soil in the CDA, either of the following two alternatives is protective and meets the remedial action objectives (RAOs) for these materials: 1) excavate residential parcels in two foot intervals up to six feet; at each two foot interval collect field samples to compare the results with the CDA RAOs. If sample results do not meet objectives, continue to excavate the soil until objectives are met up to six feet. Alternatives for the disposal of the CDA excavated materials to meet the appropriate land disposal requirements include disposal on the landfill, on the commercial parcel F, or disposal at a hazardous waste facility; then backfill excavated area with clean soil; or 2) cover the CDA materials in place with a

vegetative cover consisting of, at a minimum, 18 inches of soil with a foundation material suitable to in-fill surface voids; fence the area as a part of the landfill; and establish institutional controls in parallel with the landfill. If the residential soils are not consolidated to commercial parcel F then, an institutional control (IC) in the form of a deed restriction, or other appropriate ICs will be applied to the parcel to be zoned as commercial or industrial only, since the 695mg/kg of lead detected in the soil is an acceptable level for an industrial setting.

For the gases migrating from the landfill, install a landfill gas collection and treatment system capable of collecting and treating all gases generated by the landfill. The landfill gas collection and treatment system shall, at a minimum, comply with all standards and requirements of 326 IAC 1-3, and shall include as necessary, a vapor phase carbon collection and treatment system and an enclosed ground flare system.

Remedial Action Objectives for the Himco Dump Site are as follows:

Landfill Cover:

- To prevent exposure to soil which contains carcinogens that presents a total excess cancer risk above EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} for all site-related contaminants through all exposure pathways (i.e., ingestion, inhalation of soil-derived substances, and dermal contact);
- To prevent the exposure to soil which contains non carcinogens that present a total non carcinogenic HI greater than 1.0 for all site-related contaminants through all exposure pathways (i.e. ingestion, inhalation of soil-derived substances, and dermal contact);
- To prevent direct contact with the landfill contents that presents a potential physical hazard; and
- To maintain the long-term cover integrity.

CDA Soil Removal:

- To prevent exposure to soil that contains carcinogens that present a total excess cancer risk above EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} for all contaminants through all exposure pathways (i.e., ingestion, inhalation of soil-derived substances, and dermal contact).
- To prevent exposure to soil which contains non carcinogens that present a total non carcinogenic HI greater than 1.0 for all contaminants through all exposure pathways (i.e. ingestion, inhalation of soil-derived substances, and dermal contact).
- To prevent direct contact with the CDA contents that presents a physical hazard.

Groundwater:

- To prevent the use of groundwater which contains carcinogens in excess of MCLs or that present a total excess cancer risk above EPA's acceptable risk range of 1×10^{-4} to

1×10^{-6} for all site-related contaminants through all groundwater pathways (inhalation of volatilized substances, ingestion, and dermal contact);

- To prevent the use of groundwater which contains non carcinogens in excess of MCLs and/or that present a total non carcinogenic HI greater than 1.0 for all site-related contaminants through all groundwater pathways (inhalation of volatilized substances, ingestion, and dermal contact).
- To prevent the use of groundwater which contains site-related sodium, calcium, and iron in excess of their upper intake limits or recommended dietary allowances for sensitive populations.
- To establish a groundwater-monitoring program that will ensure compliance with all of the RAOs listed above for groundwater.

Air:

- To prevent inhalation of indoor air that contains carcinogens that present a total excess cancer risk above EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} for all site-related contaminants released from the subsurface vapor migration pathway.
- To prevent inhalation of indoor air that contains non carcinogens that present a total non carcinogenic HI greater than 1.0 for all site-related contaminants released from the subsurface vapor migration pathway.
- To prevent the future migration of hydrogen sulphide gas and methane gas beyond the boundary of the landfill.
- To establish a landfill boundary gas monitoring program that will ensure compliance with all the RAOs listed above for air.

The selected remedy for the 60 acre landfill

1. Contour and grade the existing cover:

- Conduct a pre-design investigation to characterize on-site soils (depth, nutrients, vegetation, grain size, etc.) in order to determine need for additional cover;
- Remove and dispose of on-site surface debris;
- Cover areas of exposed waste and in-fill surface voids and depressions with clean soil and suitable vegetation; grade the soil cover for proper drainage and erosion protection. It is anticipated that an 18-inch soil depth or more will be necessary to maintain vegetation and prevent exposure to on-site soils.
- Mitigate inadvertent exposure to waste materials in the future by recording or filing a deed notice regarding the landfill's site history and constituents; and

- Limit the land reuse to industrial, recreational, or commercial with institutional controls in the form of a deed restriction, or other appropriate ICs.
- 2. Construct the cover to avoid or minimize adverse effects on the wetlands;
- 3. Final grading of the total cover to no less than a two percent slope, after an accounting for the anticipated settlement;
- 4. For the gases migrating from the landfill, install a landfill gas collection and treatment system capable of collecting and treating all gases generated by the landfill. The landfill gas collection and treatment system shall, at a minimum, comply with all standards and requirements of 326 IAC 1-3, and shall include as necessary, a vapor phase carbon collection and treatment system and an enclosed ground flare system;
- 5. Conduct quarterly monitoring of the soil gas to assure that the gas collection system is functioning properly and meeting performance standards for duration of one year; semiannual monitoring for the next four years; and then reevaluate to determine the monitoring schedule for the next 25 years;
- 6. Periodic Inspections. A complete inspection of the landfill cover system, drainage structures, landfill gas (LFG) system, LFG treatment system, if necessary, and groundwater wells. Periodic inspections will be performed on a quarterly basis during the first two years post-closure. Following this period, periodic inspection will be reevaluated to determine if the inspections could be conducted semiannually;
- 7. Institutional controls in the form of deed restrictions, or other appropriate institutional controls, which prohibit both future groundwater use, and future drilling or digging into the landfill cover will be implemented;
- 8. Institutional controls will be placed on the landfill in the form of a deed restriction or other appropriate ICs, to limit the land reuse to industrial, recreational, or commercial. However, a future land use feasibility study must be conducted by the entity responsible for the redevelopment of the property to determine the property's suitability for a particular reuse scenario. Any anticipated building construction on Himco Dump will have to be evaluated and approved by EPA, in consultation with Indiana Department of Environmental Management (IDEM) to determine the soil gas interaction/impact on any structures on the landfill, as well as the displacement of contaminated soils, wastes, etc;
- 9. Install a perimeter fence around the entire site for security. If the landfill is redeveloped the fence installation may not be necessary; and
- 10. Conduct Operation and Maintenance (O&M) of all components of this remedy, which includes the vegetative cover, the soil gas collection system, and the ground-water monitoring system.

The selected remedy for the CDA and the residents living south of the landfill:

I. CDA Surface

- A. Remove all construction debris
- B. Remove all rubble

II. CDA Soil – The following two alternatives are protective and meet the RAOs for these materials.

A. Excavate residential parcels in two feet intervals, up to six feet. Check sample results at each two feet intervals.

- a) Disposal of excavated materials
 - 1. Landfill
 - 2. Commercial Parcel F
 - a) Fence as a part of the landfill
 - b) Establish ICs in parallel with the landfill
 - 3. Hazardous waste facility
- b) Backfill with clean soil
- c) Vegetate

B. Cover CDA material with soil

- a) Minimum of 18 inches of clean soil
- b) Vegetate
- c) Grade to allow for proper drainage
- d) Fence area as a part of the landfill
- e) Establish ICs in parallel with landfill

III. Commercial Parcel F

- A. If the excavated residential soils are not consolidated to parcel F, then an institutional control in the form of a deed restriction, or other appropriate ICs will be applied to the parcel to be zoned as commercial/industrial only, since the 695 mg/kg of lead detected in the soil is an acceptable level for an industrial setting.

IV. Private residential wells near CDA

- A. Abandon private residential wells per 312 IAC 13-10-2, residences that were provided municipal water supply in 1991.

- B. Establish institutional controls in the form of a deed restriction, or other appropriate ICs applied to each property to prohibit future installation of private wells for groundwater use.

The selected remedy for the residential area east and southeast of Himco Dump:

1. At a minimum, connect select residents (including the buffer zone) living on the east and southeast side of Himco Dump to the local municipal water supply (21 select and 18 buffer zone residents for a total of 39 residents). See Table 14 for a list of the addresses to be connected to the municipal water supply;
2. Abandon all residential private water wells according to the requirements listed in 312 IAC 13-10-2 once the municipal water supply has been established. Establish institutional controls in the form of a deed restriction, or other appropriate ICs applied to each property to prohibit future groundwater use; and
3. Install new monitoring wells in the buffer zone, based on the groundwater investigation study performed during the pre-design studies to monitor the vertical and spatial area where the residents are still using private wells. The new monitoring wells will be installed to capture all portions of the aquifer (shallow, intermediate and deep) to identify and correct any potential groundwater problem before the receptors are impacted.

The selected groundwater remedy and long-term monitoring at Himco Dump

1. Complete a pre-design groundwater investigation study on the south, east and southeast sides of Himco Dump to determine the contaminant concentration, rate and extent of migration of all detected contaminants. The investigation will include the vertical and spatial characterization of the contaminants to optimize the placement of the additional long-term monitoring wells in the residential buffer zone area, and the landfill perimeter. One residential well to the east of the landfill noted 1, 2-dichloropropane contamination slightly above the MCL. The ROD Amendment calls for provision of a Public Water Supply to the surrounding area. It is believed that the 1976 closure of the landfill, the 1992 removal of drums, and the 2004 enhancement of the existing landfill cover, coupled with the monitoring requirements stated in this ROD Amendment are sufficient to address the contamination;
2. Establish a long-term groundwater monitoring program to monitor the future groundwater conditions from all of the monitoring wells associated with the landfill including the newly installed landfill and residential sentinel wells. The purpose is to determine if the groundwater RAOs are being exceeded which would trigger the need for potential connection to the municipal water supply beyond the buffer zone;
3. If at any time the groundwater monitoring program indicate the possibility that contamination from the landfill is migrating beyond the presently known location, the potential need for additional alternative water supplies will be evaluated, and an appropriate response action will be implemented;
4. Monitor all groundwater monitoring wells associated with Himco Dump for a minimum of 10 years; quarterly monitoring for the first two years. Samples collected

from all of the groundwater monitoring wells will be analyzed for the following water quality parameters: Target Compound List (TCL) of Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Polychlorinated biphenyls (PCBs), Pesticides, Inorganic Target Analyte List (TAL), water quality parameters (including groundwater indicators), and the human effective compounds. Based on the results, groundwater-monitoring frequency may be decreased to semiannually for the next three years. The monitoring results will be evaluated to aid in predicting contaminant trends, and evaluate seasonal effects. At the time of the five-year review (Superfund requirement for all Sites where waste remain on-site), the groundwater long term monitoring requirements will be reassessed to determine the continued frequency and duration at that time; and

5. If during the long-term monitoring of the groundwater a hazardous chemical fails to meet the groundwater RAOs for four consecutive sampling events, a contingency remedy will be developed at that time to meet the performance standards of the RAOs and implemented to decrease the hazardous chemical's groundwater concentration back to below the groundwater RAOs.

1.5 LIST OF INSTITUTIONAL CONTROLS

Landfill Property

- Limit land use to industrial, recreational, or commercial uses either by recording a deed restriction or other appropriate institutional controls.
- Prohibit future groundwater use either by recording a deed restriction or other appropriate institutional controls.
- Prohibit future drilling or digging into the landfill cover either by recording a deed restriction other appropriate institutional controls.

Residential Properties (East and South)

- Prohibit future installation of any private wells for groundwater use and abandon the private water well for each residential property after installation of the municipal water supply, per 312 IAC 13-10-2, applicable or relevant and appropriate requirements (ARARs). See Table 15, Himco Dump Well Abandonment List.
- Prohibit future installation of any private wells for groundwater use either by recording a deed restriction or other appropriate institutional controls.
- Prohibit the use of private wells in the area located south of Himco Dump located in the City of Elkhart up to the former Bower Street Well Field either by recording a deed restriction or other appropriate institutional controls.

Parcel F Located South of the Landfill

- Limit land use to industrial, or commercial only, either by recording a deed notice or other appropriate institutional controls.

1.6 State Acceptance

The Indiana Department of Environmental Management (IDEM) has assisted in the development and review of the Administrative Record. IDEM is expected to concur with the selected remedy; the concurrence letter will be added to the Administrative Record upon receipt.

1.7 Statutory Determinations

The proposed amended remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. This remedy does not satisfy the statutory preference for remedies that reduce the toxicity, mobility, or volume as a principal element. A removal action was conducted in 1990 and in 1991 an alternate water supply was provided to residences located south of the landfill. A removal action conducted at the site in 1992 removed drums and waste material from the only hot spot identified in the landfill during the Remedial Investigation. Beyond that, the size of the landfill precludes a final remedy in which contaminants could be excavated and treated effectively.

Because this remedy will result in hazardous substances remaining onsite, a review will be conducted every five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment and to ensure that the stipulated institutional controls have been implemented and enforced.

1.8 Data Certification Checklist

The Declaration should certify that the following information is included in the ROD (or provide a brief explanation for why this information is not included):

- 1) Chemicals of concern (COCs) and their respective concentrations.

Tables 2 and 3.

- 2) Baseline risks represented by the chemicals of concern.

Tables 2 and 3.

- 3) Clean up levels established for chemicals of concern and the basis for these levels.

Section 7, "Construction Debris Area; Residential Area East and Southeast of the Landfill."

- 4) How source materials constituting principal threats will be addressed.

Section 7, "Long - Term Groundwater Monitoring at the Landfill."

- 5) Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD.

Sections 6-1, 1992 RI/FS.

- 6) Potential land and groundwater use that will be available at the site as a result of the Selected Remedy.

Sections 7.1-7 and 8, "Description of the Selected Remedy."

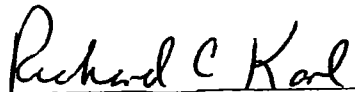
- 7) Estimated capital, annual O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected.

Alternative 3, "Enhanced Cover, Municipal Water Supply, & Passive Gas Collection System."

- 8) Key factor(s) that led to selecting the remedy.

Section 5, "Basis for the ROD Amendment."

1.7 **Authorizing Signature**



Richard C. Karl, Acting Director
Superfund Division

9-15-04
Date

PART II THE DECISION SUMMARY

1.0 INTRODUCTION

The Himco Dump Superfund Site, located adjacent to the City of Elkhart in Elkhart County, Indiana (Figure 1), has been the subject of numerous site investigations.

This document amends the ROD for the Himco Dump Superfund Site (the "Site"). The original ROD was signed on September 30, 1993. The 2004 amended ROD does not completely supersede the 1993 ROD. Much of the discussion in the old ROD remains relevant and this material is incorporated by reference. However this ROD amendment completely replaces the 1993 remedy. What the 2004 ROD amendment adds is: 1) new information concerning the stability of contaminant concentrations in groundwater at the site; 2) the evaluation of the potential effects of the existing ROD on the adjacent residential property; 3) the Agency's re-evaluation of the risk assessment based on newer site related data; and 4) a comparison of the current selected remedy versus an alternative that relies more heavily on institutional controls and long-term monitoring to achieve appropriate levels of risk reduction, using the nine evaluation criteria outlined in the NCP at 40 CFR 430(e)(2)(iii).

In modifying Himco Dump's remedy the United States Environmental Protection Agency (EPA) has followed the procedures under Section 117(c) of CERCLA, 42 U.S.C. § 9617(c). Any remedial action differs in any significant respect from a final remedial action plan; the Agency is required to publish an explanation of the significant differences and the reasons such changes were made. The decision by EPA to change the remedy at the Himco Dump Site constitutes such a significant difference. Indeed, EPA considers this to be a fundamental change in the remedy, necessitating the issuance of an amended ROD. Accordingly, on April 11, 2003, EPA released a proposed clean up plan for public comment, and published a notice of the proposed change in a major local newspaper of general circulation. On April 23, 2003, EPA explained the reasons for the change in remedy at a public meeting held in Elkhart. Comments from the public were accepted through July 12, 2003, and are addressed in Part IV of this ROD Amendment (ROD-A).

EPA is the lead Agency for the remedial action at this site, while Indiana Department of Environmental Management (IDEM) is the support Agency, who has assisted in the development and review of the Administrative Record. IDEM is expected to concur with the selected remedy; the concurrence letter will be added to the Administrative Record upon receipt

This ROD Amendment will become a part of the Administrative Record prepared by EPA for this Site, in accordance with the NCP, 40 CFR 300.825(a)(2). An index to the administrative record (Part V) is included with this document for convenience. The Administrative Record including the Responsiveness Summary and the December 2002 Supplemental Site Investigations/Site Characterization Report (SSI/SCR), is available for viewing at the site's information repository, the address for which is provided in Section 12.0 of this document.

2.0 SITE LOCATION AND DESCRIPTION

The Himco Dump Site is a closed unlicensed landfill located at County Road 10 and the Nappanee Street Extension, Cleveland Township, in Elkhart County, Indiana. The site size is approximately 60 acres, and was in operation between 1960 and 1976, (Figure 1). The area was initially a mixture of marsh and grassland. Wastes, including household refuse, construction rubble, medical waste and calcium sulfate were placed in the landfill. Some trenching activities took place on the eastern side of the site. In 1976, the landfill was closed and covered. The cover consisted of approximately one foot of sand overlying a calcium sulfate layer.

Currently, the site is not fenced. In the vicinity of the site are agricultural, residential, and light industrial land uses. There is an access road, which leads from the southeast corner of the site near the intersection of County Road 10 and Nappanee Street Extension. A locked gate is present across this access road; however, vehicles can easily drive around the gate and enter the site.

Beginning in 1978, analytical data for soil, sediment, surface water, leachate, residential basement gas, and groundwater has been collected and published in various reports. The groundwater is a sole source aquifer, characterized as a shallow and deep aquifer. The CDA bordering the southern perimeter of the landfill consists of construction rubble mixed with non-native soil (Figure 2). The CDA and its boundaries are defined primarily from 13 test trenches excavated in 1991 during the second phase of field studies for the Remedial Investigation (RI). The locations of 10 out of the 13 test trenches are depicted in Figure 3. A full discussion of the site background, history and physical characteristics of the Himco Dump Site is available in the *Final Remedial Investigation Report, Himco Dump Remedial Investigation/Feasibility Study*, published in August 1992, (SEC Donohue).

3.0 SITE HISTORY

1974 - The Indiana State Board of Health analyzed samples from shallow residential wells located immediately south of the Himco Dump Site after receiving complaints about the color, taste, and odor of groundwater from the shallow wells. The analyses indicated the presence of high levels of manganese.

1981 - The U.S. Geological Survey (USGS), in cooperation with the Indiana Department of Natural Resources and the Elkhart Water Works, completed a three-year study that determined the extent of a leachate plume potentially emanating from the Himco Dump Site by using bromide concentrations in the groundwater as an indicator. This study is detailed in the *Hydrologic and Chemical Evaluation of the Ground-Water Resources of Northwest Elkhart County, Indiana*, published in October 1981 (Imbrigiotta and Martin, 1981).

1984 - EPA field investigation team sampled monitoring wells previously installed by the USGS. Laboratory analyses showed that metals, SVOCs, and VOCs impacted the groundwater downgradient of the Himco Dump Site. The metals detected included aluminum, arsenic, barium, chromium, cobalt, selenium, beryllium, cadmium, copper, zinc, manganese, lead, nickel, and mercury. The organic compounds detected included acetone, benzene, phenol, Freon, 4-methylphenol, trans-1,2-dichloroethene, 2-butanone, chloroethane, and pyrene.

1988 - The Site was proposed for the NPL.

1989 - A Remedial Investigation/Feasibility Study (RI/FS) was initiated by SEC Donohue, under contract for EPA

February 1990 - The Site was placed on the NPL.

April 1990 - Due to reports from community interviews indicating that residents with private wells living south of the landfill were complaining about the taste, odor, and the color of their water, EPA's Emergency Response Branch sampled 27 residential wells in late April 1990. The water quality analysis indicated relatively high concentrations of iron, manganese, and sodium. After review of the results, the Agency for Toxic Substances and Disease Registry (ATSDR) recommended an alternative source of potable water due to the high levels of sodium, 3,600 parts per million (ppm), which had profound implications for persons who suffered from hypertension, diabetes, and heart ailments.

September 1991 - Test pits were excavated to characterize the Site's constituents during the remedial investigation. During one of the excavations, large quantities of leachate were observed flowing from the landfill's fill materials. The leachate was observed near the southern edge of the landfill. The leachate was analyzed and found to contain, among other hazardous substances, organic solvents including ethylbenzene (6,400 ppm), 2-hexanone (29,000 ppm), toluene (480,000 ppm), and xylene (44,000 ppm). These contaminants all have an inhalation and contact hazard to persons near the hazards, and have flash points ranging from 40-90 degrees Fahrenheit. The test pits where the hazardous substances were found were located within fifty yards from the private residences.

November 1991- Municipal water service was provided to the residents living south of the landfill. Himco Waste Away Services, Inc., Miles Laboratories, and the City of Elkhart paid for the municipal water services extension to the residences.

May 19, 1992 - Mr. Charles Himes, Jr., President of Himco Waste-Away Services Inc., signed an Administrative Order on Consent (AOC) to undertake and complete emergency removal activities to abate conditions, which presented an imminent and substantial endangerment to the public. The AOC required Himco to excavate in the vicinity of one of the test pits identified (TL-5) to locate the buried VOCs and their source. The AOC also required limited extent of contamination surveys along the southeast central periphery of the Site to assure that no additional VOCs were encountered.

May 22, 1992 - EPA initiated and provided oversight to an emergency removal action conducted by Himco Waste Away Services, Inc., which located and removed seventy-one (71), 55-gallon drums containing 50 percent VOCs such as ethyl benzene and toluene.

1992 - The Remedial Investigation Report, *Himco Dump Remedial Investigation and Feasibility Study (Donohue, 1992)* was completed. The RI fieldwork included geophysics, surveying, trenching, soil sampling, monitoring well installation, groundwater leachate sampling, landfill waste mass sampling, residential basement gas sampling, surface water and sediment sampling and wetland determination.

September 1992 - The Proposed Clean up Plan was issued to the public for review and comment.

September 30, 1993 - EPA issued the ROD for the Site. The purpose of the selected remedial action, as specified in the ROD, was to eliminate or reduce the migration of contaminants to groundwater and to reduce risks associated with exposure to the contaminated materials. The major elements of the remedial action per the 1993 ROD were:

1. Construction of a composite barrier, landfill cover (cap) consisting of the following components:
 - 18-inch thick vegetative soil layer;
 - A 6-inch thick sand drainage layer;
 - 40-mil high density polyethylene flexible membrane liner;
 - 2-foot thick low permeability (1×10^{-7}) clay liner; and
 - A soil buffer layer of variable thickness to attain the State of Indiana grade requirements (4 percent minimum).
2. Use of institutional controls on landfill property to limit land and groundwater use.
3. Installation of an active landfill gas collection system including a vapor phase carbon system to treat the off-gas from the landfill.
4. Groundwater monitoring to ensure effectiveness of the remedial action and to evaluate the need for future groundwater treatment.
5. Mitigative measures to be taken during the remedial construction activities to minimize adverse impacts to wetlands.

4.0 Post ROD Pre Design Site Activities

The overall objectives of post 1993 ROD activities were to gather additional data to supplement the existing data, such as a soil gas investigation that was needed to supplement the final pre-design technical memorandum for the Site, and to prepare a supplemental human health risk evaluation for the CDA. The purpose of the recent supplemental risk assessment was to conduct human health risk evaluations for the Site's off-property areas that were not addressed in the 1992, Baseline Risk Assessment for the CDA. Additional groundwater data was needed to ensure the effectiveness of the 1993 remedial action, and to evaluate the need for future groundwater treatment. The supplemental investigations included the September 1995 sampling event, (detailed in the *Final Pre-Design Technical Memorandum, Himco Dump Superfund Site, USACE March 1996*), and the 1996 Supplemental Site Investigation characterizing data involving the groundwater downgradient of the landfill.

4.1 1996 Supplemental Site Investigation Sampling

The objective of the 1996 Supplemental Site Investigation was to confirm the groundwater analytical detections of the 1995 Pre-Design Field Investigation, primarily benzene found in monitoring well WT116A. In consultation with IDEM, adjacent and downgradient wells were chosen to be sampled. The analytes selected were those detected during the 1995

sampling event. Groundwater samples were collected from monitoring wells WT105A, WT106A, WT111A, WT115A and WT116A. The samples were analyzed for TCL VOCs and SVOCs, and total TAL metals.

4.2 1998 SUPPLEMENTAL SITE INVESTIGATION SAMPLING

Soil, soil gas, and groundwater samples were obtained for a supplemental site investigation/risk assessment. The location of all soil borings, monitoring wells and soil gas sampling locations from the 1998 Supplemental Site Investigation may be found in Figures 4-1 through 4-12.

The major objectives of the 1998 Supplemental Site Investigation were to gather analytical data to support the completion of a supplemental human health risk assessment, and to characterize soil gas constituents. Site-specific sampling objectives included collecting additional data to:

- Assess the occurrence of organic and inorganic constituents in surface and subsurface soils within the area to the south of the landfill where construction debris was buried and quantify constituent concentrations through laboratory analysis of samples.
- Assess the occurrence of organic and inorganic constituents in shallow groundwater immediately south and east (downgradient) of the landfill and quantify constituent concentrations through laboratory analysis of samples.
- Quantitatively assess the risk from soil and groundwater to human health resulting from constituents of concern related to a release from the Himco Dump Site.
- Assess the occurrence of organic constituents in the soil gas along the southern and eastern perimeter of the landfill and quantify constituent concentrations through laboratory analysis of samples.

4.2.1 Soil Samples

A total of eighteen soil borings (SB03 through SB20) located on six residential land parcels were drilled and sampled at various locations in and around the CDA at the Himco Dump Site. Soil samples were obtained from residential land parcels D, F, M, O, P and S. No soil samples were obtained from land parcels N, Q, R and T. The final soil boring locations are shown on Figure 4-2, along with the property parcels and their respective landowners at the time sampling was completed. Chemical samples were analyzed for TCL VOCs and SVOCs, TAL metals and cyanide.

Several polynuclear aromatic hydrocarbons were detected in both surface and subsurface soil from SB04, SB05, SB11, and SB13 through SB20. In addition two semi volatile compound (1, 2-dichlorobenzene and 4-methylphenol) were detected at sampling locations SB16 and SB20, respectively. Each of the 23 target analyte list metals was detected at least once. Arsenic was detected at elevated levels in all soil samples. Lead and mercury were detected at elevated levels in one soil sample each, SB15- 0.5 (695 mg/kg) and SB20-0.5 (27.9 mg/kg), respectively.

4.2.2 Monitoring Well Installation and Groundwater Sampling

A groundwater monitoring well, WT119A was installed in the shallow portion of the aquifer downgradient of the WT116 well cluster and outside the CDA. The new monitoring well was installed to provide additional analytical data downgradient of shallow monitoring well WT116A, where previous investigations have shown groundwater to contain benzene at 15 micrograms per liter (ug/L), which is greater than regulatory limits. See Figure 4-2 for the location of WT119A.

Groundwater samples were collected from monitoring wells WT101A, WT102A, WT112A, WT114A, WT115A, WT116A and WT119A. The location of these monitoring wells may be found in Figure 4. All groundwater samples were analyzed for TCL VOCs and SVOCs, and total TAL metals plus cyanide. The monitoring well sampling events performed during 1996, 1998, and 2000, results are summarized below.

4.2.2.1 Supplemental Site Investigation Analytical Results - 1996

Five groundwater samples were collected and analyzed for TCL-VOCs, SVOCs and total TAL metals, with the exception of the sample collected from well WT116A, which was sampled for VOCs only. Total 1,2-dichloroethene, 1,1-dichloroethane, 1,2-dichloropropane, trichloroethene, and benzene were detected. Except for bis(2-ethylhexyl)phthalate, no SVOCs, including the polynuclear aromatic hydrocarbons detected in 1995 from well WT116, were detected. All of the TAL metals were detected at least once, except for antimony, beryllium, cadmium, lead, mercury, selenium and silver. See Table 6 for a summary of the 1996 sampling result.

4.2.2.2 Supplemental Site Investigation Analytical Results - 1998

Seven groundwater samples were collected and analyzed for TCL- VOCs, SVOCs, and total TAL metals plus cyanide. 1, 1-dichloroethane was detected during this sampling event. Diethylphthalate and bis(2-ethylhexyl)phthalate (SVOCs), were also detected during this round of groundwater sample collection. All of the TAL metals and cyanide were detected at least once except for cadmium, thallium, and vanadium. See Table 7 for a summary of the 1998 sampling result.

4.3 1999-2000 Supplemental Site Investigation Sampling

The major objectives of the 1999-2000 supplemental site investigation were to quantify the lateral migration of landfill associated gases to the east of the landfill, to confirm the presence or absence of constituents that may contribute to the Himco area groundwater risk, to determine the degree in which groundwater at the Himco Dump Site is currently being affected in both a horizontal and vertical sense by the landfill, and to define any temporal/spatial patterns or trends in the groundwater geochemistry related to the landfill. This section presents the associated tasks from one soil gas sampling effort and three separate but related groundwater sampling events, all of which are part of the latest supplemental site investigation program conducted at the Himco Dump Site.

Site-specific sampling objectives included collecting additional data to:

- Assess the occurrence of organic constituents in the soil gas along the eastern perimeter of the landfill, and quantify constituent concentrations through laboratory analysis of samples.
- Assess the occurrence of organic and inorganic constituents in groundwater east and southeast (downgradient) of the landfill using residential water supply wells, and quantify constituent concentrations through laboratory analysis of samples.
- Assess the occurrence of organic and inorganic constituents in groundwater at various levels within the aquifer system using existing monitoring wells surrounding the Himco Dump Site, and quantify constituent concentrations through laboratory analysis of samples.
- Assess the occurrence of organic and inorganic constituents in groundwater from multiple depths at selected locations in an attempt to determine potential impacts by the Himco Dump Site to deeper portions of the aquifer system, and quantify constituent concentrations through laboratory analysis of samples.

The location of all monitoring wells and direct-push sampling points from the 1999-2000 supplemental site investigation may be found in Figure 4, 4-1, and 4-12, respectively. Groundwater samples were collected from monitoring wells WTB1, WTB3, WTB4, WTE1, WTE3, WTG1, WTG3, WT101A, WT101B, WT101C, WT102A, WT102B, WT102C, WT105A, WT106A, WT111A, WT112A, WT112B, WT113A, WT113B, WT114A, WT114B, WT115A, WT116A, WT116B, WT117A, WT117B, WT118B, and WT119A between April and May 2000. Also found on Figure 4 are the property parcels where the residential water well samples were collected. See Table 8 through 10, for the 2000 sample results.

4.3.1 Residential Well Sampling Results – March/April 2000

Twenty-three well groundwater samples were collected and analyzed for TCL-VOCs, SVOCs, and total TAL metals. Eighteen of the residential well samples were also analyzed for bromide and sulfate. VOCs, vinyl chloride, 1, 2-dichloropropane, 1, 1-dichloroethane, cis-1,2-dichloroethene, benzene, 1,2-di-chloroethane, and chloroform were detected at least once. No SVOCs were detected. All of the TAL metals were detected at least once except for aluminum, antimony, beryllium, cadmium, lead, mercury, selenium, silver, thallium, and vanadium. Bromide was detected in all of the residential well samples at estimated concentrations; sulfate was also detected in all of the residential well samples. The analysis results of both the March sampling event and the April sampling were similar. The results of the residential sampling events summaries are located in Table 4 and Table 5, respectively.

4.3.2 Direct-Push Sampling Results - April/May 2000

A network of monitoring and direct-push groundwater sampling points were sampled to obtain supplemental data on groundwater quality beneath and surrounding the Himco Dump Site, including both upgradient and downgradient locations. A total of 10 direct-push groundwater samples were collected from 4 locations (GPE, GP101, GP114 and GP16) along the south and southeast edge of the Himco Dump Site and analyzed for TCL-VOCs, SVOCs, total TAL metals, bromide and sulfate. The VOCs chloroethane, carbon disulfide, 1, 1-dichloroethane, cis-1, 2-dichloroethene, 1, 2-dichloropropane, trichloroethene, and benzene were detected in at least one of the samples collected. Bis (2-ethylhexyl) phthalate was detected in four of the ten samples. Phenol was detected in one sample. Except for antimony, beryllium, selenium, silver and thallium, all of the TAL metals were detected at least once. The direct-push sampling locations and depths at each sampling location are shown in Figure 4-12.

4.3.3 Emerging Contaminant Sampling

Groundwater samples were collected from four wells at and near the Site (three monitoring wells and one residential well), to determine the concentrations of wastewater affected "emerging contaminant" compounds. The USGS has developed field and research analytical protocols for contaminants that are not routinely monitored in urban settings, including landfills. The USGS collected the samples for information only, as part of a national reconnaissance using newly developed laboratory methods to provide baseline information on the environmental occurrence of these contaminants in groundwater wells susceptible to animal or human wastewater sources. These emerging contaminant compounds include:

- Antibiotics, including those that are used for veterinary and/or human health (including select aminoglycosides, beta-lactams, fluoroquinolones, macrolides, sulfonamides, and tetracyclines).
- A set of prescription and nonprescription drugs used for human health (for example, acetaminophen, cimetidine, ibuprofen, ranitidine and trimethoprim), and
- A broad spectrum of industrial and household wastewater products (including select antioxidants, detergents, disinfectants, and plasticizers). Since this landfill has been a disposal point for two pharmaceutical companies, the likelihood of disposal of these emerging contaminants at Himco Dump was considered highly plausible and needed to be evaluated. Samples were also analyzed for the TCL, VOCs, SVOCs, PCBs, Pesticides, metals, and for Inorganic TAL.

The results of these sampling events are located in Table 11 and Table 12.

4.4 Soil Gas Investigation

Two supplemental soil gas investigations were performed between 1998 and 1999. The 1998 gas investigation concentrated primarily on the CDA south of the landfill to County Road 10, with limited investigations to the east of the landfill and John Weaver Parkway. Soil gas samples were collected from 45 locations (TT-54 through 87, 89 through 92, 95 through 98 and 100 through 102) during 1998 and 1999. Phase I soil gas sampling locations are shown

on Figure 4-3; Phase II sampling locations are shown on Figure 4-8. A total of 49 soil gas samples were collected during the second (1999) soil gas investigation. These samples were collected from areas east and southeast of the landfill boundary, extending to the front yards of residences located east of the Himco Dump Site.

The soil gas investigations detected a large number of VOCs. The chlorinated ethenes (tetrachloroethene, trichloroethene, dichloroethene, and vinyl chloride) was the most predominant group, in terms of detected concentrations, followed in decreasing concentrations by the chlorinated ethanes (1,1,1-trichloroethane, dichloroethane and chloroethane), and then BTEX (benzene, toluene, ethylbenzene, and xylene).

Several of the other compounds detected in the soils and/or leachate, and not detected in the soil gas, have lower vapor pressures. All compounds appear to be distributed similarly with the more elevated concentrations found just off the south boundary of the landfill, and exhibiting a trend of decreasing concentrations as one move away from the landfill perimeter. The fate and migration of these contaminants is dependent on the geologic conditions and the chemical properties of the contaminants. This pathway of exposure, based on the distribution of contaminants, is likely independent of the groundwater migration pathway. In all cases, the highest detected concentrations are located in the southeast corner of the site just northwest of the intersection of County Road 10 and John Weaver Parkway. Overall, the soil vapor contamination have been delineated with some minor exceptions found, one on the south side of County Road 10, and one on the east side of John Weaver Parkway. For example, three isolated detections of chlorinated ethenes, and ethanes were also found on the east side of John Weaver Parkway. Figures 4-4 through 4-11 show the soil gas result. Table 15 and Table 16 provide a summary of the Phase I and Phase II soil gas analyses, respectively.

5.0 The Basis for the ROD Amendment

In April 1995, U.S. EPA began the remedial design process using Federal funds. The process included a pre-design groundwater investigation (PDI). Information developed during the design process supports a change in the remedy, as summarized below:

Groundwater monitoring data from the PDI, when compared to data from the RI sampling events in 1990 and 1991, indicated that the groundwater releases at the site are potentially in a state of equilibrium. Presently, the contamination levels are comparable to or lower than those identified in the RI/FS, except as discussed in Section 6.0 below.

When the Agency began design of the composite cap and fence alignments for the areas of concern as required in the 1993 ROD, it became clear that all of the residents adjacent to the landfill would lose the use of part of their property when the cap and fence were installed over the CDA. This issue was not raised prior to the 1993 ROD. EPA began to explore options to minimize the impact of the remedy on residents' properties.

In considering what (if any) effect the above information could have on the selected remedy, EPA revisited the baseline risk assessment (BRA) and determined that new site data and refinement of the 1992 risk assessment assumptions warrant reconsideration of the risk in a number of areas of the document, as discussed the following section. Additional soil sampling and a risk evaluation confirmed the necessity of making the CDA subject to the remedy in the same way as the landfill proper. Furthermore, based on the March 2000

sampling analysis, EPA also determined that an unacceptable degree of uncertainty exists for groundwater in a residential area east of the landfill, which was not previously addressed in the 1993 ROD. Additional groundwater sampling and risk evaluation of the eastern residential area of the landfill were needed to ensure the protection of human health.

Based on the new groundwater data regarding the residents living east of the landfill (both downgradient and side gradient), and if the site does not deteriorate further, it is not necessary to construct the 1993 Resource Conservation and Recovery Act (RCRA) Subtitle C composite cap. The amended ROD will also add the requirement for the extension of the local municipal water supply to 39 residents (21 select and 18 buffer zone residents) with additional groundwater monitoring to resolve uncertainties about the risk to human health and the environment in the area of the residents living east of the John Weaver Parkway. The other remaining elements of the original 1993 ROD that will remain in effect are:

1. Institutional controls in the form of deed restrictions, or other appropriate institutional controls to prevent any future groundwater use on the landfill property;
2. Landfill groundwater monitoring to ensure the effectiveness of the remedial action and to evaluate the need for future groundwater treatment; and
3. Mitigate adverse impacts to the wetlands during the remedial action construction.

The 1992 risk assessment estimated the risk from exposure to groundwater and the landfill proper, but did not address the CDA or the eastern residential area. The CDA is approximately four acres in size and is subdivided into seven residential and one commercial property parcels. The residential properties are currently occupied, and the commercial parcel is currently vacant. The existing homes on these residential parcels are connected to the local municipal water supply. However, these homes also have operable private groundwater wells.

The 2002 Site Supplemental Site Investigation/Site Characterization Report (SSI/SCR) evaluated the health risk associated with the soil and the groundwater for the CDA, and for the groundwater for the eastern residential area.

6.0 Current and Future Potential Human Health Risk

The results of the human health risk assessment indicate a potential for risk to the following receptors if exposed to the soil within the CDA or groundwater migrating from the site.

6.1 Age-Adjusted and Child Resident (CDA)

Evaluated in the CDA were the potential risks to current and future residents who live to the south of the Himco Dump landfill boundary, and who may have exposure to surface and deeper soil, and to groundwater from uncapped wells. Groundwater data collected from 1978 to 2000 were evaluated for usability in the risk evaluation. From this data set, total risk to the residents living to the south of Himco Dump from exposure to groundwater for the southern perimeter was quantitatively evaluated using concentrations measured from the monitoring well pair MW116A/119A, combined with the risk from exposure to soil

associated with the CDA. These monitoring wells were selected because they are located immediately downgradient to the September 1991 leachate observed near the southern edge of the landfill. The leachate was analyzed and found to contain organic solvents including ethylbenzene (6,400 ppm), 2-hexanone (29,000 ppm), toluene (480,000 ppm), and xylene (44,000 ppm). These contaminants all have an inhalation and contact hazard to persons near the hazards and have flash points ranging from 40 to 90 degrees Fahrenheit. The test pits where the hazardous substances were found were located within 50 yards of the private residences. An emergency removal action was conducted also during May 1992 in this same general area, where seventy-one 55-gallon drums were removed containing VOCs, which included 50% toluene, and ethylbenzene. See Table 1 for a summary of the chemicals found in the CDA, the eastern monitoring wells and the eastern residential private wells.

The overall total potential carcinogenic risk to the residents within the CDA ranged from 3.2 in 10,000 (3.2×10^{-4}) to 4.5 in 10,000 (4.5×10^{-4}). The groundwater pathway contributes the majority of the risk, with the remaining risk coming from soil pathway.

The incremental lifetime cancer risks (ILCR) due to site-related chemicals in the soil, estimated using the age-adjusted resident scenario (i.e., a 30 year exposure consisting of a child from one to six years old and an adult from seven to 31 years old), are greater than 1 in one million (1×10^{-6}) at all residential land parcels. The range is from 1.9 in 100,000 (1.9×10^{-5}) to 1.5 in 10,000 (1.5×10^{-4}).

The soil carcinogenic risks are attributable primarily to ingestion of and the dermal contact with arsenic, benzo-(a) pyrene, and di-benzo(a,h)anthracene. In addition, at all residential land parcels, inhalation exposure to benzene and vinyl chloride, and the ingestion of arsenic, benzene, 1,2-dichloropropane, and vinyl chloride contributed to the groundwater risk of 3.0 in 10,000 (3.0×10^{-4}).

In the CDA, lead was detected above the residential screening level of 400mg/kg (695 mg/kg) in one surface soil sample at commercial land parcel F. Lead was also detected in other surface, near surface and subsurface soil samples at residential land parcels F, D, S and O; no soil samples were collected at residential land parcels N, R, Q, and T. In order to evaluate the risk for those parcels, the soil concentrations were projected upon those residential land parcels.

The potential total noncarcinogenic risks to residents within the CDA, based on the child resident scenario (the more conservative non carcinogenic assessment), ranged from a HI of 46.0 to 50.0. The estimated HI for the child resident exposed to groundwater is 46.0 at all residential land parcels, and is primarily due to the inhalation exposure to benzene, and 1,2 dichloropropane, and from the ingestion of antimony, arsenic, iron, manganese, and thallium. The remaining HI of 0.11 to 4.5 is due to soil exposure and is primarily due to the ingestion and dermal contact with antimony, arsenic, copper, manganese, and mercury. Two residential land parcels had estimated site-related HI's > 1.0 for the child resident exposed to soil. The estimated site-related HI from soil pathways for the residential land parcel S is 2.9, due to exposure to arsenic, antimony, copper, and manganese. For commercial land parcel F, the HI is 4.5 due to exposure to lead.

6.2 Construction Worker (CDA)

The potential risk to a current or future construction worker, who is involved in a residential home improvement project, and who has exposure with soils, via ingestion, dermal contact, and inhalation of particulates during excavation and on-site activities conducted for 180 days over a nine month time-frame was evaluated.

For the construction worker, the estimated ILCR due to site-related chemicals in soil at residential land parcels S, T, D, and commercial parcel F slightly exceed 1 in 1,000,000 (1×10^{-6}). The estimated risks to chemicals in the soil at residential land parcels S, T, D and commercial parcel F are 1.7×10^{-6} , 4×10^{-6} , 7.1×10^{-6} , and 1.3×10^{-6} , respectively. An unacceptable non cancer HI > 1.0 to a current or future construction worker is possible in the commercial land parcel F (HI 1.3) and is primarily due to ingestion of and dermal contact with metals in soils.

The assessment only considered short-term exposure such as would occur with a residential home improvement project. It did not consider potential health impact to construction worker, which could be imposed by major construction projects, such as new home construction or a large scale development, which could occur under either the current or future land use.

A risk summary for the carcinogens and the noncarcinogens for the chemicals found at Himco Dump and the Residential Wells are provided in Table 1-1, and Table 2, respectively.

6.3 Age – Adjusted Resident (Eastern Downgradient Groundwater)

Monitoring wells WT101A, WT114A, WT114B and the direct-push sampling points GP16, GP101, and GP114 were chosen to evaluate the risk to residents living to the east of the Himco Dump from exposure to groundwater from the eastern perimeter of the landfill. To determine if groundwater contaminants were migrating from the landfill to the east (side gradient), the direct push methodology was used to collect data to supplement the lack of adequate landfill monitoring wells in this area. Samples were also collected from some of the residential wells east of the landfill; the residential analyses showed concentrations of contaminants at, or higher than, concentrations found in the landfill monitoring wells. The contaminant concentrations exceeded risk screening levels and/or MCLs.

The estimated carcinogenic risk, using the age-adjusted resident scenario, to the adult resident east of Himco Dump from exposure to groundwater is 5.8 in 10,000 or (5.8×10^{-4}). The risk is predominantly due to: 1) ingestion of arsenic 5.4 in 10,000 or (5.4×10^{-4}), and 2) inhalation exposure to benzene 2.0 in 100,000 or (2.0×10^{-5}).

6.4 Child Resident (Eastern Downgradient Groundwater)

The estimated non carcinogenic risk to residents living east of the Himco Dump is from exposure to groundwater, HI of 29.0. The child resident scenario was evaluated for the non-carcinogenic risk from exposure to groundwater, because it is the most conservative scenario for the risk assessment. The site risk is predominately due to: 1) the child's inhalation exposure to benzene and 1, 2-dichloropropane; HI of 4.4, and 2.0, respectively, and 2) the child's ingestion of arsenic, iron, manganese, and thallium, HI of 21.0. When the total HI from exposure to groundwater is separated by target organ (i.e. arsenic - skin, iron - liver,

manganese - central nervous system, thallium and benzene - blood, and 1,2-dichloropropane - respiratory), all of the target organ HIs are greater than a HI of 1.0.

7.0 The 2004-ROD Amendment

EPA proposes to amend the Site's ROD to modify the 1993 landfill composite cap design, and to establish contingencies for further groundwater containment and/or remediation. If during the long-term monitoring of groundwater a hazardous constituent exceeds the groundwater RAOs, an additional remedial measure will be evaluated and implemented. The contingency remedy will be developed at that time to meet the performance standards of the groundwater RAOs, implemented to decrease the hazardous constituent's groundwater concentration back to below the RAOs.

The rationale for modifying the 1993 cap is as follows:

- Since the landfill waste mass is in contact with the water table, the effectiveness of the 1993 cap is minimized and therefore is not cost effective;
- The 1993 cap does not remove the potential threat to the receptor. In this ROD amendment the affected receptors (residents) will be connected to the local municipal water supply, therefore the increased cost of the 1993 cap is not necessary;
- The architectural/structural requirement of the 1993 cap to protect the cap's integrity would have increased the cost or prohibited the potential redevelopment of the Site. A Brownfields Grant has been recently awarded to the City of Elkhart in the form of "in-kind" services for the Site to ascertain the feasibility of restoring this property to productive reuse; and
- An extensive groundwater monitoring system will be implemented to ensure the protectiveness of all potential receptors.

7.1 The Description of the Selected Remedy for the Landfill

1. Contour and grade the existing cover;
 - Conduct a pre-design investigation that would characterize on-site soils (depth, nutrients, vegetation, grain size, etc.) in order to determine need for additional cover;
 - Remove and dispose of on-site surface debris;
 - Cover areas of exposed waste and in-fill surface voids with clean soil and suitable vegetation; grade the soil cover for proper drainage and erosion protection. It is anticipated that an 18-inch soil depth or more will be necessary to maintain vegetation and prevent exposure to on-site soils.

- Mitigate inadvertent exposure to waste materials in the future by recording/filing of a deed notice for the landfill regarding site history and constituents;
 - Limit the landfill reuse to industrial, recreational, or commercial with institution controls in the form of a deed restriction or other appropriate institutional controls.
2. Construction of the cover will be implemented to avoid or minimize adverse effects on the wetland;
 3. Final grading of the total cover to no less than a two percent slope, after an accounting for the anticipated settlement;
 4. For the gases migrating from the landfill, install a landfill gas collection and treatment system capable of collecting and treating all gases generated by the landfill. The landfill gas collection and treatment system shall, at a minimum, comply with all standards and requirements of 326 IAC 1-3, and shall include as necessary, a vapor phase carbon collection and treatment system and an enclosed ground flare system;
 5. Quarterly monitoring of the soil gas to ensure the gas collection system is functioning properly for duration of one year; semiannually for the next four years; and then re-evaluate to determine the monitoring schedule for the next 25 years;
 6. Periodic Inspections. A complete inspection of the landfill cover system, drainage structures, landfill gas (LFG) system, LFG treatment system if necessary, and groundwater wells. Periodic inspections will be performed on a quarterly basis during the first two years post-closure. Following this period, periodic inspections will be reevaluated to determine if the inspections could be conducted semiannually;
 7. Institutional controls in the form of a deed restrictions or other appropriate institutional controls that prohibit both future groundwater use, and future drilling or digging into the landfill cover;
 8. Institutional controls will be placed on the landfill in the form of deed restrictions or other appropriate institutional controls, which will limit the land reuse to industrial, recreational, or commercial. However, a future land use feasibility study must be conducted by the entity responsible for the redevelopment of the property to determine the property's suitability for a particular reuse scenario. Any anticipated redevelopment of the property will be evaluated by EPA in consultation with IDEM to determine the soil gas interaction/impact on any structures on the landfill, as well as the displacement of contaminated soils, wastes, etc;
 9. Install a perimeter fence around the entire site for security. If the landfill is redeveloped the fence installation may not be necessary; and

10. Conduct Operation and Maintenance (O&M) of all components of this remedy, which include the vegetative cover, the soil gas collection system, and the ground-water monitoring system.

The selected remedy for the CDA and the residents living south of the landfill:

I. CDA Surface

- A. Remove all construction debris
- B. Remove all rubble

II. CDA Soil – The following two alternatives are protective and meet the RAOs for these materials.

- A. Excavate residential parcels in two feet intervals, up to six feet. Check sample results at each two feet intervals.

- a) Disposal of excavated materials.

1. Landfill
 2. Commercial Parcel F
 - a) Fence as a part of the landfill
 - b) Establish ICs in parallel with landfill

3. Hazardous waste facility

- b) Backfill with clean soil
 - c) Vegetate

- B. Cover CDA material with soil.

- a) Minimum of 18 inches of clean soil
 - b) Vegetate
 - c) Grade to allow for proper drainage
 - d) Fence area as a part of the landfill
 - e) Establish ICs in parallel with landfill

III. Commercial parcel F.

- A. If the excavated residential soils are not consolidated to parcel F, then an institutional control in the form of deed restriction, or other appropriate ICs will be applied to the parcel to be zoned as commercial/industrial only, since the 695 mg/kg of lead detected in the soil is an acceptable level for an industrial setting.

IV. Private residential wells near CDA

- A. Abandon the private residential wells per 312 IAC 13-10-2, residences that were provided with municipal water supply in 1991.

- B. Establish institutional controls in the form of a deed restriction, or other appropriate ICs applied to each property to prohibit future installation of private wells for groundwater use.

The selected remedy for the residential area east and southeast of Himco Dump:

1. At a minimum, connect select residents (including the buffer zone) living on the east and southeast side of Himco Dump to the local municipal water supply (21 select and 18 buffer zone residents, for a total of 39 residents). See Table 14 for a list of the addresses to be connected to the municipal water supply;
2. Abandon all residential private water wells according to the requirements listed in 312 IAC 13-10-2, once the municipal water supply has been established. Institutional controls in the form of a deed restriction will be applied to each property to prohibit future groundwater use; and
3. Install new monitoring wells in the buffer zone, to monitor the spatial area where the residents are still using private wells. The new monitoring wells will be installed to capture all portions of the aquifer (shallow, intermediate and deep) to identify and correct a potential groundwater problem before the receptors are impacted.

The selected groundwater remedy and long-term monitoring at Himco Dump

1. Design and complete a groundwater investigation on the south and east side of Himco Dump to determine the contaminant concentration, rate and extent of all detected contaminants. The investigation will include the vertical characterization of the contaminants to optimize the placement of the additional long-term monitoring wells in the residential buffer zone area. One residential well to the east of the landfill noted 1, 2-dichloropropane contamination slightly above the MCL. The ROD Amendment calls for provision of a Municipal Water Supply to the surrounding area. It is believed that the 1976 closure of the landfill, the 1992 landfill drum removal, and the 2004 enhancement of the existing landfill cover, coupled with the monitoring requirements stated in this ROD Amendment are sufficient to address the contamination;
2. Establish a long-term groundwater monitoring program to monitor the future groundwater conditions from all of the monitoring wells associated with the landfill including the newly installed wells. The purpose is to determine if the groundwater RAOs are not being exceeded which would trigger the need for connection to the municipal water supply beyond the buffer zone;
3. If at any time the groundwater monitoring program indicates the possibility that contamination from the landfill is migrating beyond the presently known location, the potential need for additional alternative water supplies will be evaluated and an appropriate response action will be implemented;

4. Monitor all groundwater monitoring wells associated with Himco Dump for a minimum of 10 years; quarterly monitoring for the first two years. Samples collected from all of the groundwater monitoring wells will be analyzed for the following water quality parameters: TCL of VOCs, SVOCs, PCBs, Pesticides, Inorganic TAL, water quality parameters (including groundwater indicators), and the human effective compounds. Based on the results, groundwater-monitoring frequency may be decreased to semiannually for the next three years. The monitoring results will be evaluated to aid in predicting contaminant trends, and to evaluate seasonal effects. At the time of the five-year review (Superfund requirement for all Sites where waste remain on-site), the groundwater long term monitoring requirements will be reassessed to determine the continued frequency and duration at that time; and
5. At each 5-year review, or earlier if necessary, EPA in consultation with IDEM, will evaluate the following criteria to determine the need for more or less remedial measures:
 - a. Groundwater results collected during the previous monitoring period years to determine trends in contaminant concentrations, if any;
 - b. Effectiveness of the source control measures to prevent contaminant migration beyond the downgradient boundary;
 - c. Potential for the contaminants in the groundwater to meet or exceed performance standard/RAOs triggers level; and
 - d. Additional measures may be necessary if an evaluation of the above criteria indicates concentrations in the groundwater have not decreased; and source control measures do not meet the performance standard/RAOs;
6. Implement institutional controls with deed restrictions or utilize other institutional controls, which prohibit any future groundwater use, and prohibit the installation of any new private groundwater wells in the Site's vicinity.

8.0 Description of Alternatives

The following alternatives were considered for amending the Himco Dump Superfund Site ROD, considering new information on the implementation schedule of the 1993 ROD remedy and the results of the pre-design studies. The alternatives considered pertained to the composite cap and the groundwater for the residents living in the CDA and the eastern residential area are listed below. All other components of the 1993 remedy remain unchanged.

As required by the NCP, the "No Action" alternative was considered solely as a baseline to compare other alternatives.

Alternative 1 No Action

Alternative 2 1993 ROD Remedy

Alternative 3 2004 Enhanced Landfill Cover, Municipal Water Supply, Passive Gas System. The selected remedy

Each of the alternatives considered for the ROD Amendment are individually compared against each of the nine criteria described below.

- (A) **Overall protection of human health and the environment.** Alternatives shall be assessed to determine whether they can adequately protect human health and the environment, in both the short and long-term, from unacceptable risks posed by hazardous substances, pollutants or contaminants present at the Site by eliminating, reducing, or controlling exposures to levels established during development of remediation goals consistent with 40 CFR § 300.430(e)(2)(1). Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.
- (B) **Compliance with ARARs.** The alternatives shall be assessed to determine whether they attain applicable or relevant and appropriate requirements and federal environmental laws and state environmental or facility siting laws or provide grounds for invoking one of the waivers and paragraph (f) (1) (ii) (C) of section 300.430.
- (C) **Long-term effectiveness and permanence.** Alternatives shall be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that shall be considered, as appropriate, include the following:
- (1) Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity for bioaccumulation.
 - (2) Adequacy and reliability of controls such as containment systems and deed restrictions that is necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative such as a cap, a slurry wall or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.
- (D) **Reduction of toxicity, mobility, or volume through treatment.**

The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility or volume shall be assessed, including how treatment is used to address the principal threats posed by the Site. Factors that shall be considered, as appropriate, include the following:

- (1) The treatment or recycling processes the alternatives employ and materials they will treat;
- (2) The amount of hazardous substances, pollutants, or contaminants that will be destroyed treated or recycled;
- (3) The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reduction(s) are occurring;
- (4) The degree to which the treatment is irreversible;
- (5) The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity for bioaccumulation of such hazardous substances and their constituents; and
- (6) The degree to which treatment reduces the inherent hazards posed by principal treats at the Site.

(E) **Short term effectiveness.** The short-term impacts of alternatives shall be assessed considering the following:

- (1) Short-term risks that might be posed to the community during implementation of an alternative;
- (2) Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures;
- (3) Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation; and
- (4) Time until protection is achieved.

(F) **Implementability.** The ease or difficulty of implementing the alternatives shall be assessed by considering the following types of factors as appropriate:

- (1) Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.
- (2) Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions);
- (3) Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and specialists, and provisions to ensure any necessary additional resources, the availability of services and materials, and availability of prospective technologies.

(G) **Cost.** The types of costs that shall be assessed include the following:

- (1) Capital costs, including both the direct and indirect costs;
- (2) Net present value of capital and O&M costs.

(H) **State Acceptance.** The state concerns that shall be assessed include the following:

- (1) The state's position and key concerns related to the preferred alternative and other alternatives;
- (2) State comments on ARARs or the proposed use of waivers.

(I) **Community Acceptance.** This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about or, oppose.

Alternative 1: No Action

Description:

Estimated Cost: \$0

Estimated Time to Implement: None

Under this alternative, no remedial action would be taken at Himco Dump Site.

Alternative 2

Composite Cap, Active Gas Collection System, & Groundwater Monitoring

ALTERNATIVE 2: 1993 ROD REMEDY		COST(S)
▪ 2004 Revised 1993 ROD Remedy		10,899,000
▪ Description consisting of:		
▪ Composite Barrier Solid Waste Cap		
▪ Active Landfill Gas Collection and Treatment System		
▪ Groundwater monitoring and Institutional Controls		
Total (Capital Cost)		10,889,000
LONG -TERM OPERATION, MAINTENANCE, AND MONITORING		
▪ Annual O&M Cost		623,000
▪ 30 - Year Landfill Cap O&M		18,705,000
Present Worth Cost (Single Payment 30-year O&M)		7,738,000
Total Present Worth Project Cost (Single Payment Capital + O&M Cost)*		18,627,000
CONTINGENT REMEDY COMPONENTS		
▪ Groundwater Treatment System		1,658,000
▪ 30-Year Groundwater Treatment System O&M		17,003,800

Note: The 1993 ROD Remedy Total Present worth cost was: \$11,821,000.

*The total present worth project cost is estimated based on the 1993 cost with a 2 percent cost escalation over a 10 year period.

Alternative 3:**Enhanced Cover, Municipal Water Supply & Passive Gas Collection System**

ALTERNATIVE 3 THE 2004 SELECTED REMEDY		COST (\$)
Landfill cover enhancement (approximately 25 acres; 18" select fill + 6" topsoil)		934,756
Construction Debris Area (CDA) Removal and Restoration (@ 2' intervals up to 6')		494,556
- Excavation and relocation of debris cost per 2' interval (\$34,024.00)		
- CDA Sampling (Labor cost, material cost, analytical cost per 2' interval)		17,451
Landfill Gas Collection System (Passive designed to go Active)		332,471
Monitoring Well Installation (n = 6)		53,589
South and East Side Groundwater Investigation		238,350
- Residential Well Surveys (\$45,850.00)		
Construction Debris Area Residential Well Abandonment (n = 7)		3,475
East Side Residential Municipal Connection & Abandonment (n = 39)		385,101
Real Estate Filling Fees		13,900
5-year Reviews (6)		165,000
Fence (60 acres)		369,283
Total (Capital Cost)		3,007,932
LONG-TERM OPERATION, MAINTENANCE, AND MONITORING		
Annual O&M Cost (Landfill cover, quarterly monitoring of LF-gas, and all MW)		253,609
30-Year Landfill Cap O&M (2yrs-Quarterly; 8yrs-Bi-annually; and 20yrs annually)		73,575
Present Worth Cost (Single Payment 30-year O&M)		3,147,028
Total Present Worth Projected Cost (Single Payment O&M Cost)		7,475,388
CONTINGENT REMEDY COMPONENTS		
Additional East Side Residential Municipal Connections & Abandonment (n=10)		9,874
Active Gas Collection System		1,482,354
Construction Debris Area Soil Cover with Access Restrictions (including fence)		188,757

COST ESTIMATE SUMMARY NOTES

1. Present Worth Cost Estimates were based on a 7 percent Multi-Year Discount Factor of 12.409.
 - a. Reference: *A Guide to Developing and Documenting Cost Estimates During Feasibility Study*; EPA 540-R-00-002; OSWER 9355.0-75; July 2000.
 - b. Present Worth or Present Value: cost estimates is defined as the amount of funds that need to be set aside at the initial point in time (base year) to assure that funds will be available in the future, as they are needed to fund annual costs.
2. The 1993 ROD costs were taken from 1993 ROD Table 10 Cost Summary
3. The 1993 ROD cost estimate did not contain detailed information of how the estimate were developed.
4. The 2004 Cost Estimate contains the following cost new items:
 - a. East Side Groundwater Investigation

- b. CDA Residential Well Abandonment
- c. East Side Residential Well Abandonment
- d. Real Estate Filing Fees
- e. 5-Year Reviews (6 total)
- f. Future Land Use FS
- g. Residential Municipal Water Connection

5. The 1993 ROD cost estimate was based on the 1993 cost with a 2 percent cost escalation over a 10 year period.

6. The Cost Estimate Summary was based on the “Basis for the ROD Amendment” section which included an outline of the recommended remedy with assumptions and comments.

9.0 Summary of Comparative Analysis of Alternative

A comparative discussion of all alternatives is presented below. The alternatives are compared based upon the nine evaluation criteria discussed in section 8.0.

Overall Protection of Human Health and the Environment

Only Alternative 3 is considered to be protective of human health and the environment. It is the only alternative that is protective in the long-term with the potential that the plume may migrate further east, impacting more downgradient residential wells.

Compliance with ARARs

Alternative 1 will not meet any of the applicable or relevant and appropriate requirements. Both Alternative 2 and Alternative 3 will meet ARARs.

Long-Term Effectiveness and Permanence

Given that the groundwater the groundwater plume has migrated east, impacting existing residential wells, neither Alternative 1 nor Alternative 2, are effective in the long-term. Only Alternative 3 is effective in the long-term.

Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

Alternatives 1, 2, and 3 would not provide for any reduction, mobility, or volume through treatment.

Short-Term Effectiveness

Alternatives 2 and 3 would be equally protective in the short-term since all effects can be mitigative. Because Alternative 3 requires some construction activity to hook the individual

homes to the municipal water mains, there is an attendant increased risk due to traffic and general construction risks. However these risks are considered low.

Implementability

Alternatives 2 and 3 would be equally implementable. All construction materials are readily available.

Cost

Alternative 2 if constructed in 2004 would be the most expensive with its total present worth project cost of \$18,627,000 compared to the cost of the 2004 amended remedy of \$7,475,388.

State Acceptance










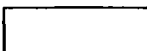
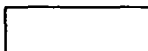
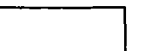
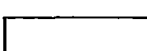











The Indiana Department of Environmental Management (IDEM) has assisted in the development and review of the Administrative Record. IDEM is expected to concur with the selected remedy; the concurrence letter will be added to the Administrative Record upon receipt.

Community Acceptance

Alternatives 1 and 2 are unacceptable to the community. The local government prefers Alternative 3, because it supports the possibility of site reuse. Alternative 2 does not support the possibility of site reuse.

The specific public comments received, and EPA's responses are outlined in the Responsiveness Summary.

10.0 Evaluation of Alternatives

Nine Evaluation Criteria	No Action	1993 ROD Remedy	2004 Amended Remedy
1. Overall Protection of Human Health and the Environment			
2. Compliance with ARARS			
3. Long – Term Effectiveness and Permanence			
4. Reduction of Toxicity Mobility, or Volume through Treatment			
5. Short – Term Effectiveness			
6. Implementability			
7. 2004 Total Present Worth Cost (Single Capital Payment with O&M Cost)	\$0	\$18,627,000	3,147,028
8. State Acceptance			
9. Community Acceptance			



Does not meet criteria



Meet the criteria



Partially meet the criteria

11.0 STATUTORY DETERMINATIONS

U.S. EPA's primary responsibility at Superfund Sites is to undertake remedial actions that protect human health and the environment. Section 121 of CERCLA has established several other statutory requirements and preferences. These include the requirement that the selected remedy, when completed, must comply with all applicable ARARs imposed by Federal and State Environmental Laws, unless the invocation of a waiver is justified. The selected remedy must also provide overall effectiveness appropriate to its costs, technologies, or resource recovery technologies, to the maximum extent practicable. Finally, the statute establishes a preference for remedies which employ treatment that significantly reduces the toxicity, mobility or volume of contaminants.

The selected remedy will satisfy the statutory requirements established in Section 121 of CERCLA, as amended by SARA, to protect human health and the environment, will comply with ARARs (or provide grounds for invoking a waiver), will provide overall effectiveness appropriate to its costs, and will use permanent solutions and alternate treatment technologies to the maximum extent practicable. Treatment is not a component of the selected remedy because an attempt to treat the hazardous substances present at the site in soils would not provide a sufficiently significant additional decrease in risk presented by the site to justify the increased cost of attempting such treatment at this time.

1. *Protection of Human Health and the Environment*

Implementation of the selected remedy will protect human health and the environment by reducing the risk of exposure to contaminants present in surface soils at the site. An adequate enhancement of the final cover for the site will reduce the risk of exposure to contaminants present in soil at the site. Institutional controls will be imposed to restrict uses of the site to prevent exposure to contaminants in the soil. No unacceptable short-term risk will be caused by the implementation of the remedy. The community and site workers may be exposed to dust and noise nuisances during construction of the final cover. Mitigative measures will be taken during remedy construction activities to minimize impacts of construction upon the surrounding community and environs. Ambient air monitoring will be conducted and appropriate safety measures will be taken if contaminants are emitted.

The proposed amended remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. However, because treatment of the principal threats of the site was not found to be practicable, this remedy does not satisfy the statutory preference for remedies that reduce the toxicity, mobility, or volume as a principal element. A removal action conducted in 1990 extended an alternate water supply to residences located south of the landfill. A removal action conducted at the site in 1992 removed drums and waste material from the hot spot identified in the landfill during the Remedial Investigation. Beyond that, the size of the landfill precludes a final remedy in which contaminants could be excavated and treated effectively.

Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after the start of the remedial action.

2. *Compliance with ARARs*

The selected remedy will comply with all identified applicable or relevant and appropriate federal requirements, with those state requirements which are more stringent, unless a waiver is invoked pursuant to Section 121(d) (4) (B) of CERCLA. The ARARs for the selected remedy are listed below:

A. *Federal ARARs*

Chemical-Specific Requirements

Chemical-specific ARARs regulate the release to the environment of specific substances having certain chemical characteristics. Chemical-specific ARARs typically determine the standard for clean up at a site.

Resource Conservation and Recovery Act (RCRA)

As the contaminants at this site were placed prior to the effective date of the regulations, the chemical-specific requirements of RCRA are not applicable. RCRA may still be relevant and appropriate. If the remedy were being implemented at the time of closure of Himco Dump (1976), a Subtitle C composite cover would be the most relevant and appropriate cover. However, after the emergency removal of the 71 drums in 1992, the groundwater data collected after that time suggest that residual contamination with little or no new hazardous wastes or hazardous waste constituents are now migrating from the landfill. Therefore, today, a Subtitle C composite cover is no longer appropriate. The Indiana Open Dump Closure regulation, 329 IAC 10-4 is the most relevant and most appropriate ARAR.

Safe Drinking Water Act

40 CFR 141

Federal Drinking Water Standards promulgated under the Safe Drinking Water Act (SDWA) include both Maximum Contaminant Levels (MCLs) and, to a certain extent, non-zero Maximum Contaminant Level Goals (MCLGs), that are applicable to municipal drinking water supplies servicing 25 or more people. At the Himco Dump Site, MCLs and MCLGs are not applicable, but are relevant and appropriate, because the unconfined aquifer below the site is a Class II aquifer which has been used by residences bordering the site, and is presently being used by residences in the area surrounding the site and could potentially be used in the future as a drinking water source.

The National Contingency Plan (NCP) at 40 CFR 300.400(e)(2)(i)(B) provides that MCLGs established under the Safe Drinking Water Act that are set at levels above zero, shall be attained by remedial actions for groundwaters that are current or potential sources of drinking water. The point of compliance for federal drinking water standards is at the boundary of the solidified/stabilized waste, because this is the point where humans could potentially be exposed to contaminated groundwater. Because this site will have the cover enhanced, the point of compliance will be at the boundary of the final cover. Groundwater monitoring wells will be installed at the point of compliance to ensure that any release of contamination from the site, which could adversely affect the aquifer, is detected at the

earliest possible stage. Existing groundwater wells in the aquifer will also be monitored, and additional wells will be drilled and monitored, as necessary.

40 CFR 141 requires that groundwater used as drinking water meet Maximum Contaminant Levels (MCLs) for contaminants of concern.

Municipal Water Connections

40 CFR 141: National Primary Drinking Water Regulations;

40 CFR 142: National Primary Drinking Water Regulations Implementation; and

40 CFR 143: National Secondary Drinking Water Regulations

Location-Specific Requirements

Location-specific ARARs are those requirements that derive from the physical nature of the site's location and features of the local geology and hydrogeology such as wetlands and floodplains.

Resource Conservation and Recovery Act (RCRA)

Executive Orders 11988, 11990, 40 CFR Part 6, Appendix A

The 1992 RI identified wetlands adjacent to the site, the action must be carried out in such a way as to prohibit discharge of dredged or fill material into wetlands without a permit, avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible. Executive Order 11990 (Protection of Wetlands) is an applicable requirement. Executive Order 11990 requires that actions taken at the Site be conducted in a manner minimizing the potential for destruction, loss, or degradation of wetlands.

ARARs for wetlands will be met through the continued evaluation of the wetlands, and if necessary, implementation of a plan to limit degradation, or restore the wetlands if the remedial action degrades the wetland.

Action-Specific Requirements

Landfill Cover Enhancement, Groundwater Monitoring, Gas Collection

40 CFR 258: Post Closure Care

Post-closure care must be conducted for 30 years as a RCRA requirement. However for CERCLA the requirement is indefinite for waste left in place and will be monitored through the 5 year review process, and consist of at least the following:

(1) Maintaining the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover;

(2) Monitoring the ground water in accordance with the requirements of subpart E of this part and maintaining the groundwater monitoring system, and

(3) Maintaining and operating the gas monitoring system in accordance with the requirements of §258.23.

Clean Air Act

40 CFR 50 and 52

The Clean Air Act and the regulations cited above require that select types and quantities of air emissions be in compliance with regional air pollution control programs, approved State Implementation Plans (SIPs) and other appropriate federal air criteria. The selected remedy involves installation of a gas collection system.

Construction Debris Area

40 CFR 257: Criteria for Classification of Solid Waste Disposal Facilities and Practices (Open Dumps)

B. *State ARARs as Identified by the State of Indiana:*

Ambient Air Quality Standards: 326 IAC 1-3;

Volatile Organic Compound Emission Standards: 326 IAC 2-1.1-3(e)(1)(D), 326 IAC 2-5.1-2(a)(1)(C), 326 IAC 2-5.1-3(a)(1)(D), and 326 IAC 2-5.1-3(a)(1)(E);

Indiana Fugitive Dust Control: 326 IAC 6-4;

Open Dumping and Open Dumps: 329 IAC 10-4;

Permanent Abandonment of Wells: 312 IAC 13-10-2;

Surface Water Quality Standards: 327 IAC 2-1;

Solid Waste Land Disposal Facilities: 329 IAC 10; and

Hazardous Waste Permit Program and Related Hazardous Waste Management: 329 IAC 3.1
Off-site disposal of any material excavated from the landfill or Construction Debris Area will be governed by these rules.

Wetlands: IC 13-18-22-1: This is the statutory authority to govern isolated wetlands. Administrative rules will be established in the near future.

The remedy will attain the state standards listed above to the extent that such standards are applicable or relevant and appropriate, promulgated standards are more stringent than the comparable federal standard.

12.0 PUBLIC PARTICIPATION COMPLIANCE

Compliance with the public participation requirement of Sections 113(k)(2)(B) (i-v) and 117 of CERCLA have been achieved for the Site by the following actions:

- Site information repositories were established at the Elkhart Public Library and EPA's Region 5's Record Center to allow local access to the Site related documents;
- The Site's Administrative Record has been updated to include the Proposed Plan for the ROD Amendment and other documents relied upon for this ROD Amendment, and has been placed in the Site Information Repositories mentioned above;
- A formal advertisement announcing the commencement of the public comment period, the availability of the proposed plan, and the time and place of the public meeting were placed in the local papers of general circulation;
- The Proposed Plan for the ROD Amendment was released for public comment and placed into the Administrative Record, April 2003;
- A public meeting was held on April 23, 2003 at the City Council Chambers at which EPA presented the Proposed Plan to the community and received written and verbal comments. A transcript was kept of the public meeting and was made available to the public and placed in the Administrative Record and Site repositories. A follow-up meeting was held on July 8, 2003 at the City Council Chambers to provide more information to the residents who were or were not going to be placed on the municipal water supply;
- A ninety-day public comment period was established on April 11, 2003 and ended July 12, 2003. Two requests for extensions were received and granted; and
- EPA has received both oral and written comments regarding the Proposed Plan for a ROD Amendment. Comments have been addressed in the Responsiveness Summary, Part IV of this document.

This ROD Amendment will become a part of the pursuant to the National Oil and Hazardous Substances Contingency Plan (NCP), Section 300.825(a)(2). The Administrative Record can be viewed at the Site's repository located at:

Elkhart Public Library
300 South 2nd Street
Elkhart, Indiana

These documents are also located at EPA Region 5 Record Center- 7th floor, Ralph Metcalf Building, 77 West Jackson Boulevard, Chicago, Illinois, 60604.

Figure 1
Site Location Map

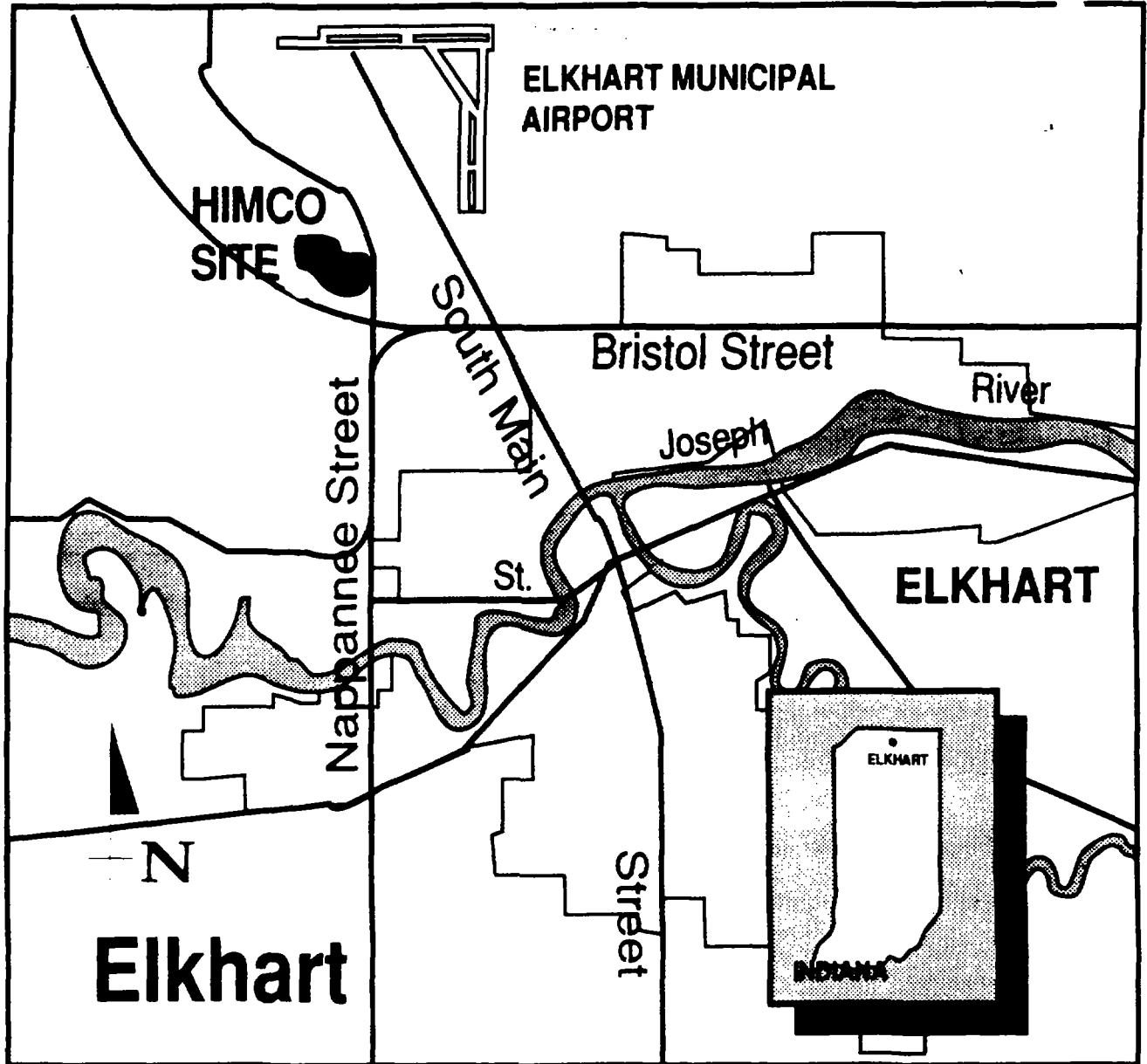
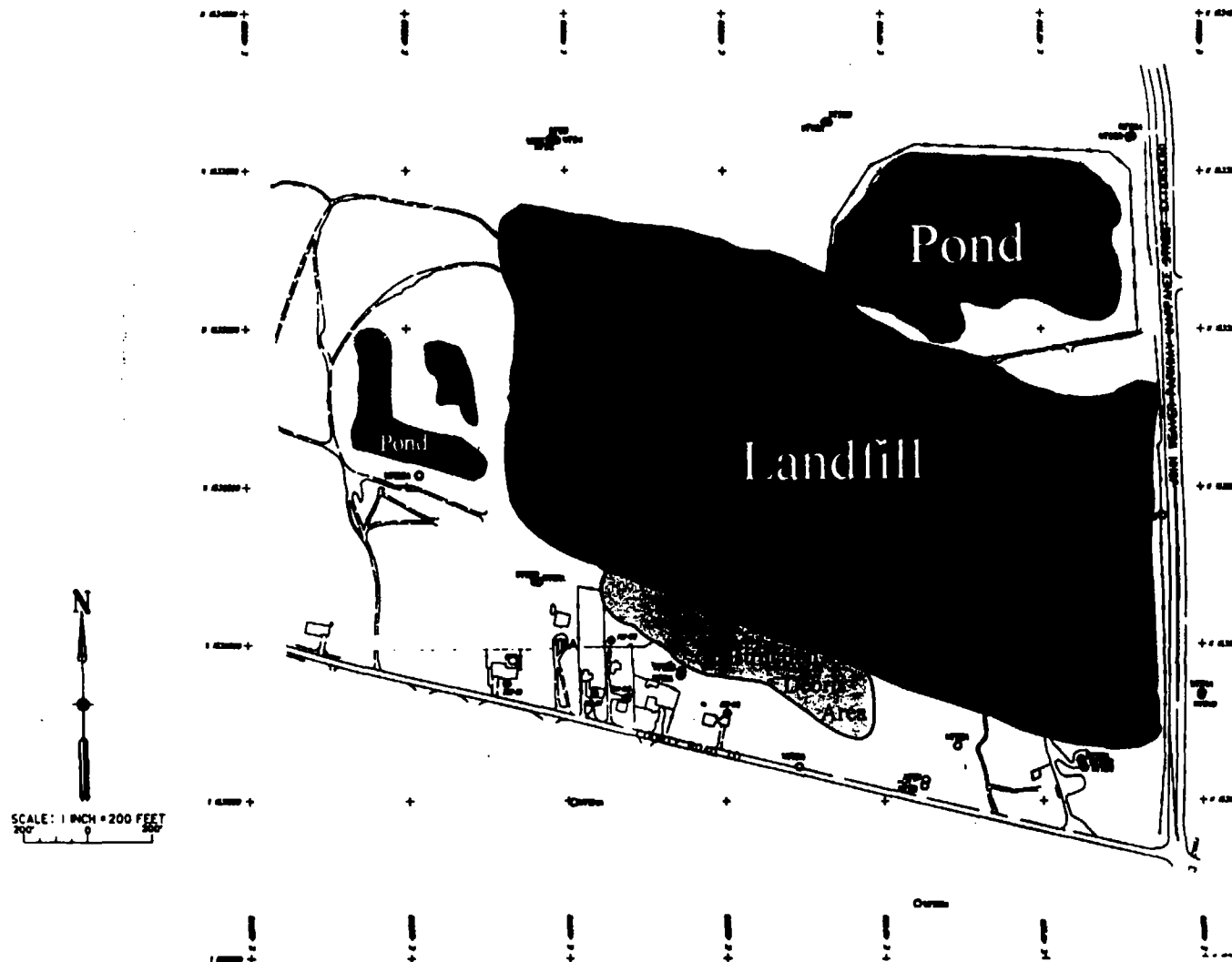
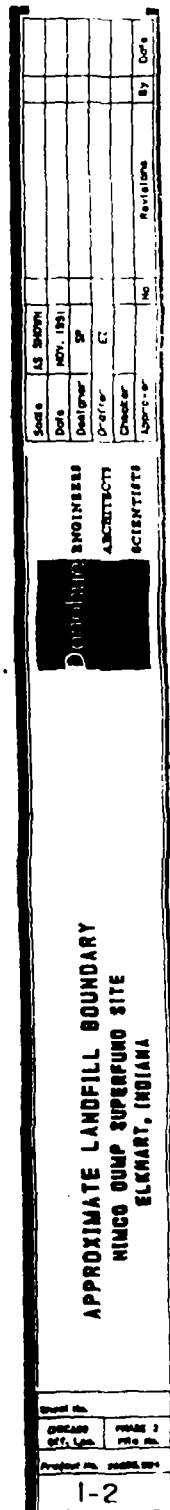


Figure 2

Site Layout Map



21



LEGEND

- WTD1A EXISTING MONITORING WELL
△ WTP1 ABANDONED MONITORING WELL
● RW-08 RESIDENTIAL WATER WELL

LOT NO. 3
RW-12

RESIDENTIAL LOT NUMBER AND
RESIDENTIAL WATER WELL
THAT WAS SAMPLED

GPE
 30-32
 36-37
 41-43

DIRECT PUSH GROUND WATER SAMPLING LOCATION. SAMPLING DEPTHS ARE NOTED ADJACENT TO THE LOCATION SYMBOL.

NOTES:

1. THE WTG WELL CLUSTER IS LOCATED APPROXIMATELY 0.8 MILES EAST-NORTHEAST OF THE INTERSECTION OF COUNTY ROAD 10 AND JOHN WEAVER PARKWAY, AND CANNOT BE SHOWN ON THIS MAP.
2. THE WTJ WELL CLUSTER IS LOCATED APPROXIMATELY 0.56 MILES SOUTHEAST OF THE INTERSECTION OF COUNTY ROAD 10 AND JOHN WEAVER PARKWAY, AND CANNOT BE SHOWN ON THIS MAP.

FIGURE 4

CLIMATE IMPACT

HIMCO DUMP SUPERFUND SITE
EPA MONITORING AND RESIDENTIAL WELL
SAMPLING LOCATIONS

Abstract

Figure 4-1

USGS Monitoring Wells Sampling Locations

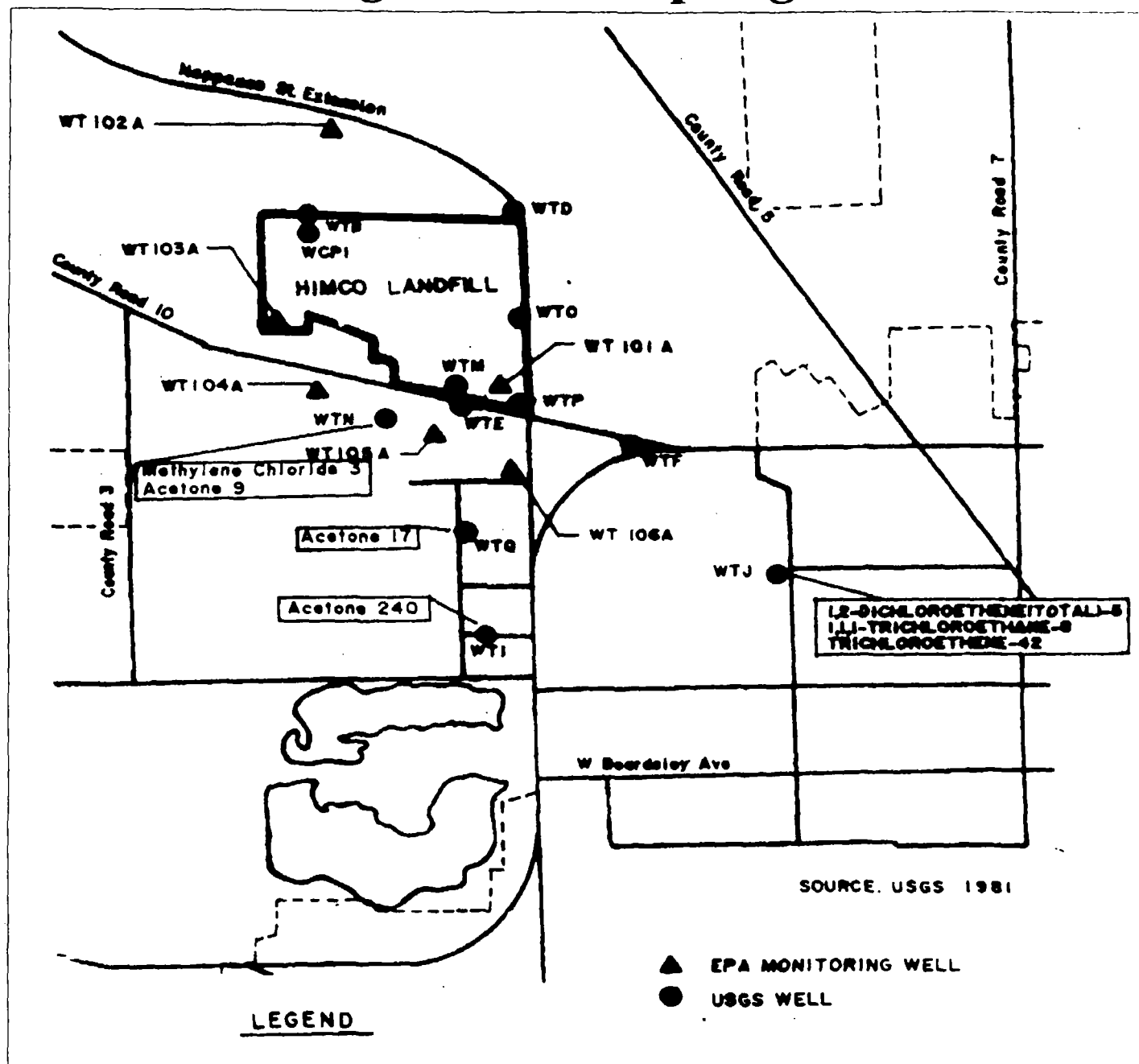
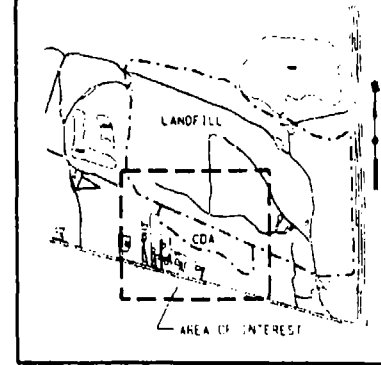


Figure 4-2

CDA Soil Boring & MW Locations

LOCATION MAP
(NOT TO SCALE)



KEY PROPERTY OWNERS

B	CLD CORP.
C	MILES, INC.
D	ALONZO CRAFT, JR.
E	RICHARD L. BURKE
F	ALONZO CRAFT, JR.
G	AMERICAN ELECTRIC POWER CO.
H	CITY OF ELKHART LEGAL DEPT.
I	CITY OF ELKHART LEGAL DEPT.
J	CLD CORP.
K	CLD CORP.
L	HERMAN & PATRICIA RUMFELT
M	DAN STRAHM
N	HELEN KOLANOWSKI
O	STEVE COLBY
P	NOBLE BOWERS, c/o SELMA BOWERS
Q	ALONZO CRAFT, JR.
R	NOBLE & SELMA BOWERS
S	ALONZO CRAFT, JR.
T	NOBLE & SELMA BOWERS
U	CLD CORP.
V	ARCHITECTURAL CORP. OF AMERICA
W	ARCHITECTURAL CORP. OF AMERICA
X	ALBERT M. MORSE
Y	MILES, INC.
Z	MILES, INC.
AA	SELMA BOWERS
BB	RICHARD & WANIDA SMITH
CC	ELKHART COMMUNITY SCHOOL
DD	DAVE AND JOAN GEESAMAN

LEGEND

- WT101A Existing Monitoring Well
- RW 08 Residential Water Well
- ⊕ SB14 Soil Boring Sampling Location
- TL-1 Trench

NOTES:

1. Horizontal and Vertical Controls according to NAD 83 Geodetic and State Plane Coordinates. For a complete list and description of control points referenced and set, contact the JSEPA and/or Long, Feeney & Associates, Inc.

2. Proposed 3 Phase Overhead Power Line 12,470 V Phase to Phase

100' 0 100'

Graphic
Scale
0 to 100'

HIMCO DUMP SUPERFUND SITE
HIMCO DUMP, ELKHART, INDIANA
SITE INVESTIGATION

Figure 4-4

Phase I soil gas detected total chlorinated ethanes:

Chloroethane, 1,1-trichloroethane, and 1,1-dichloroethane

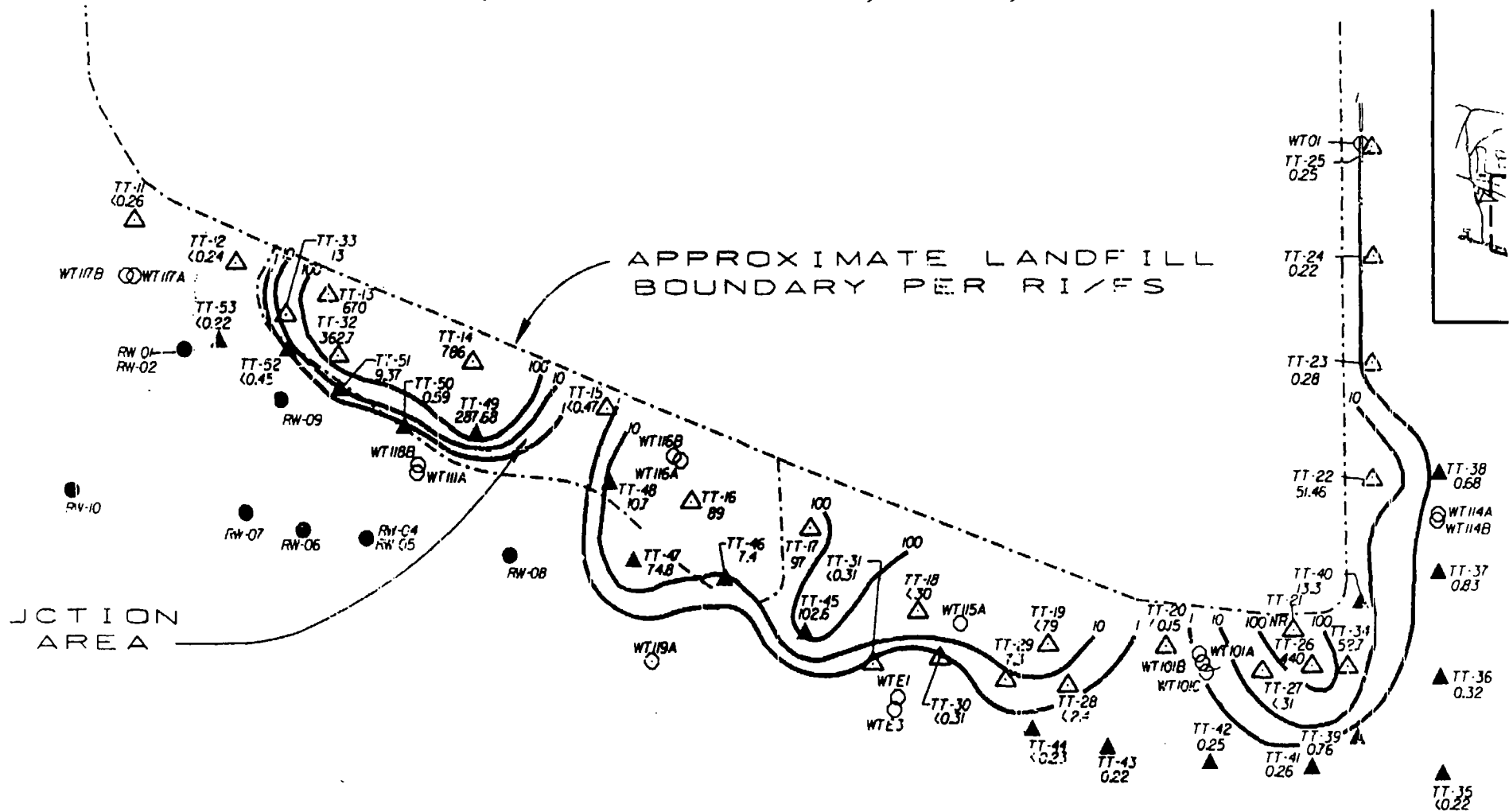


Figure 4-5

Phase I soil gas detected chlorinated ethenes: tetrachloroethene, dichloroethene, and vinyl chloride

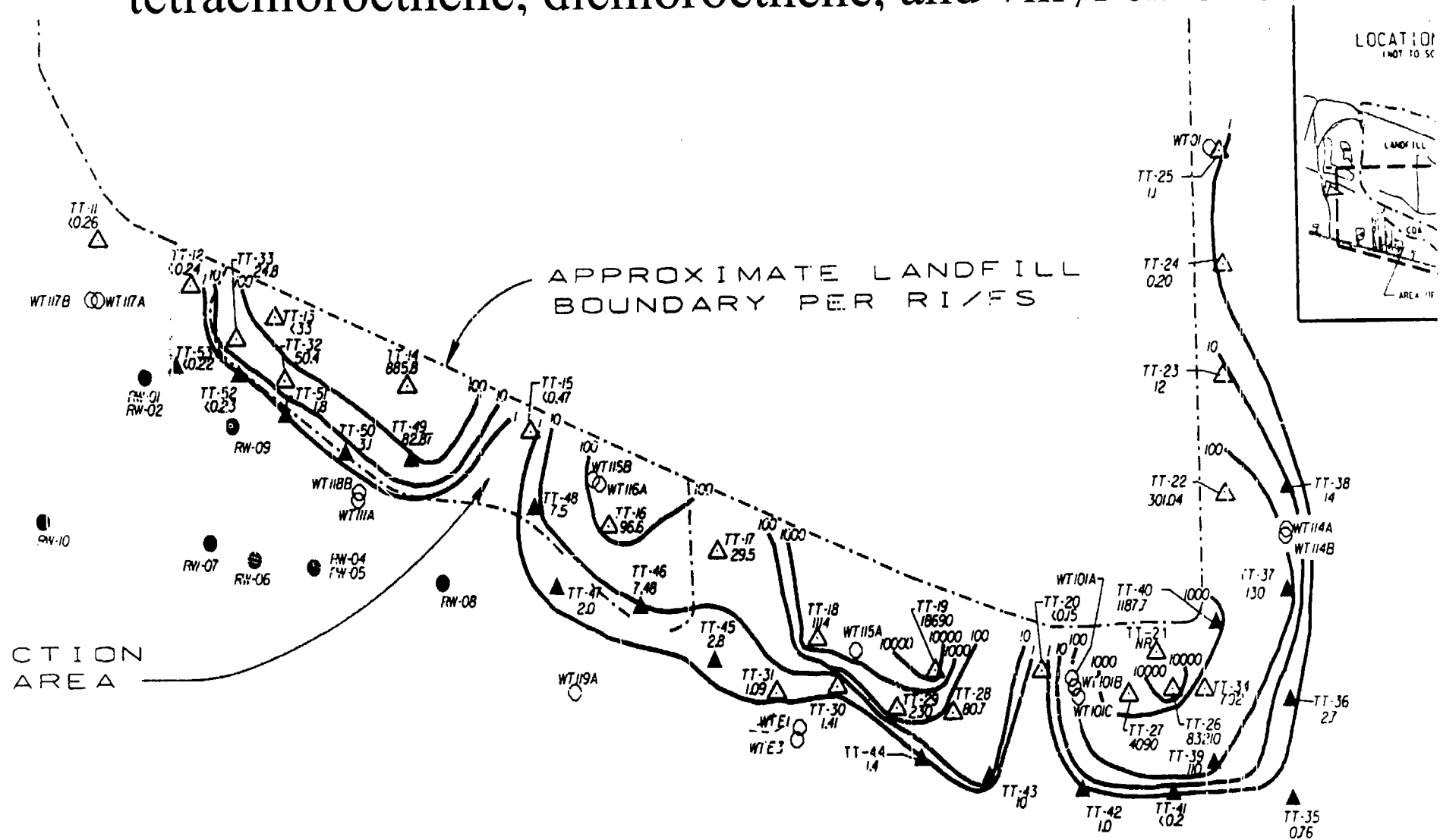


Figure 4-6

Phase I soil gas detected BTEX:

Benzene, toluene, ethylbenzene, and xylene

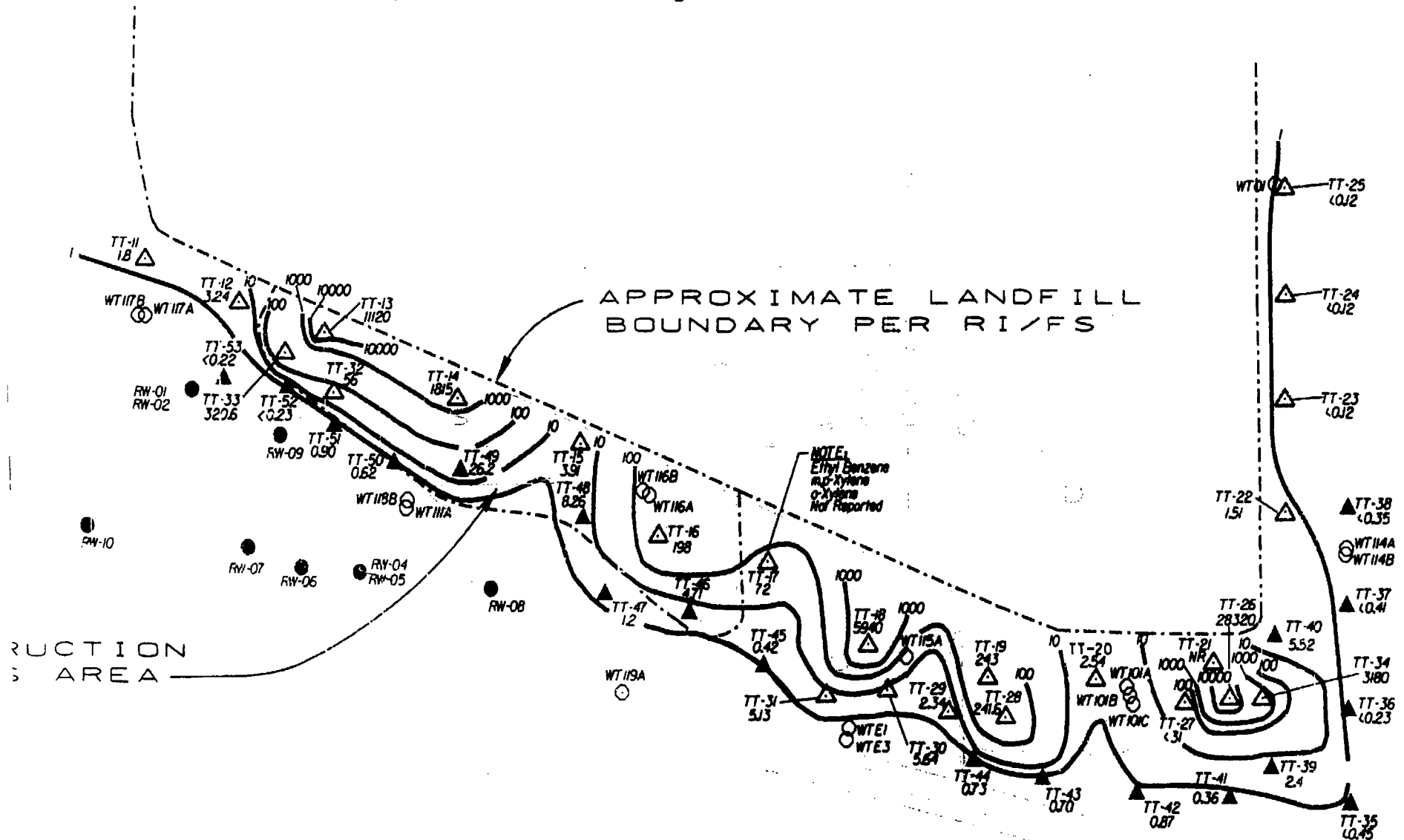
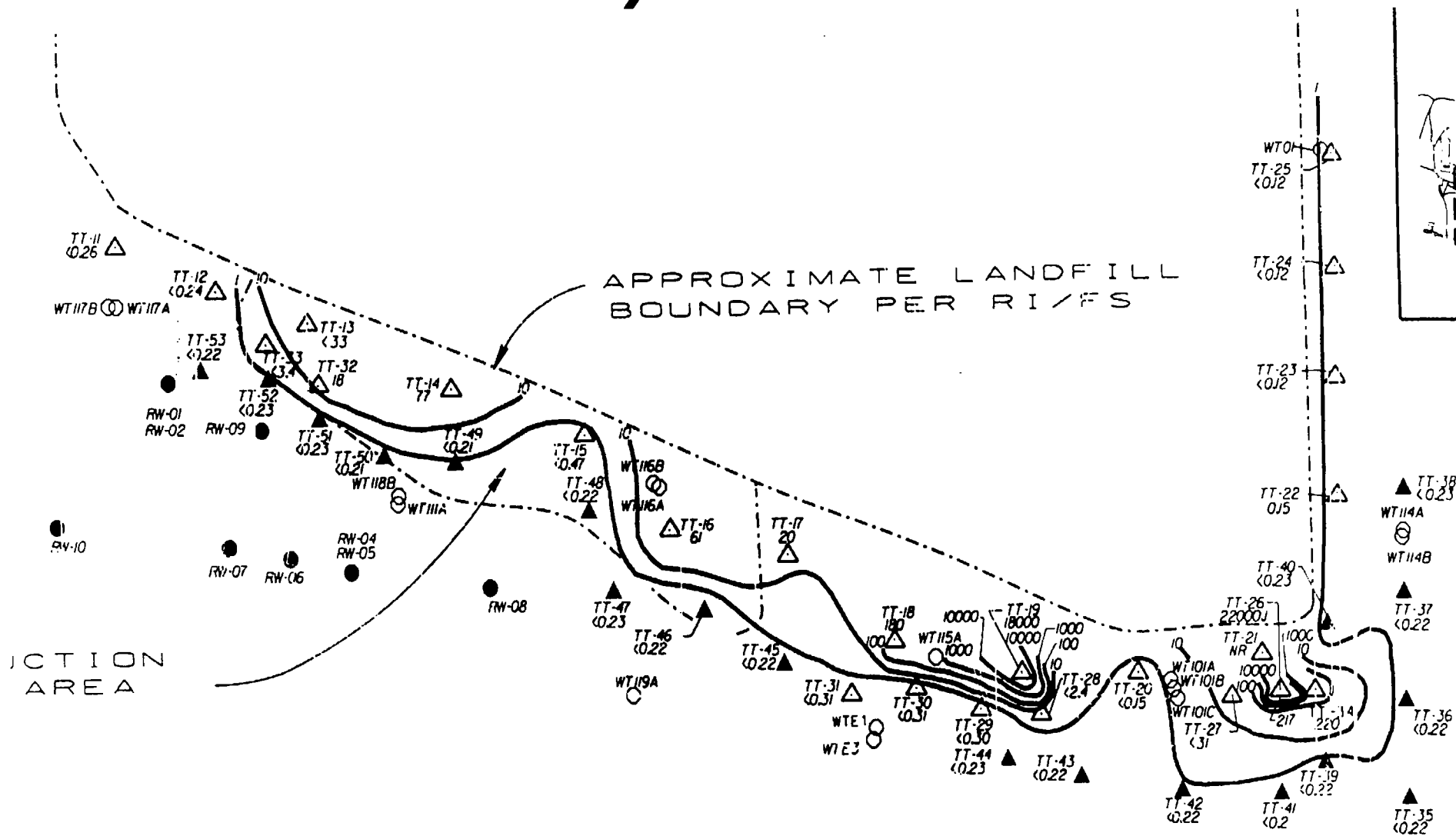


Figure 4-7

Phase I soil gas detected : Vinyl Chloride



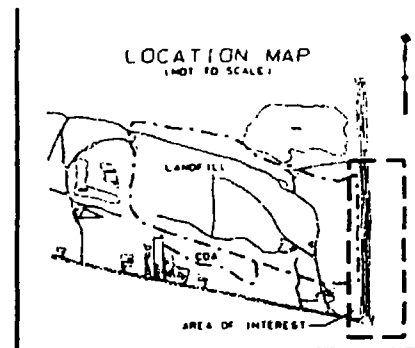
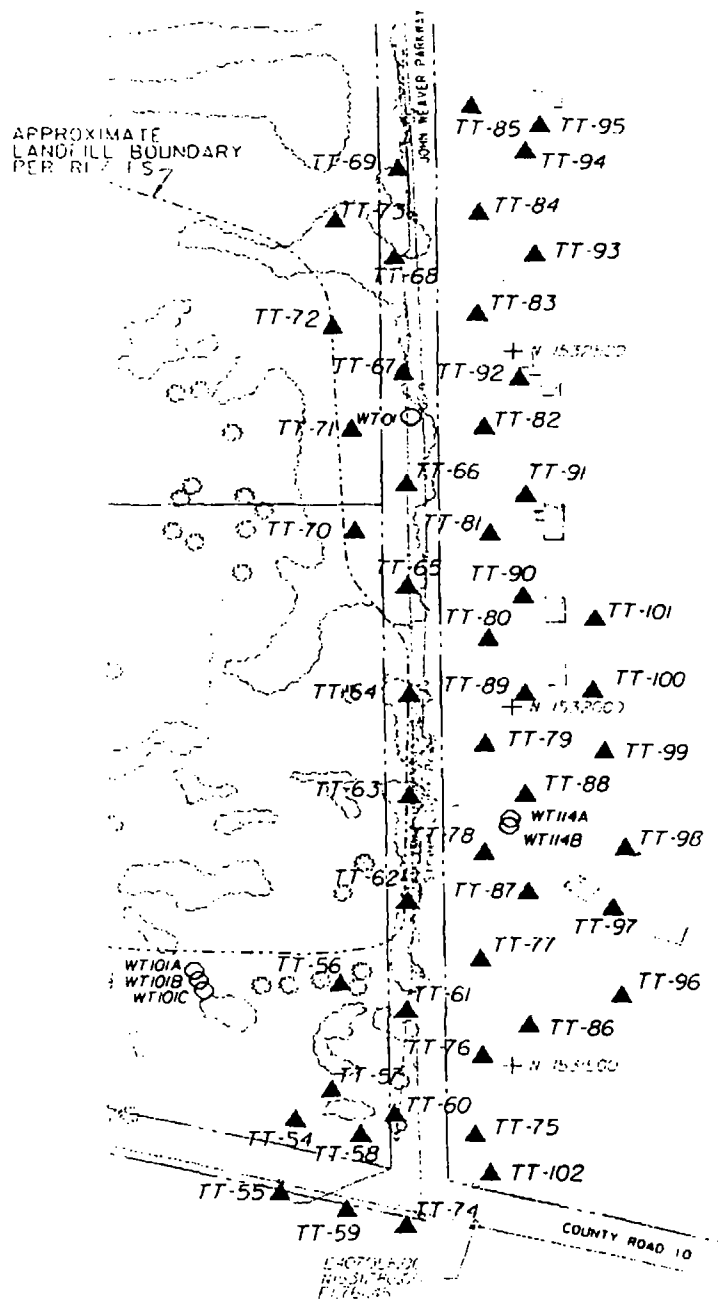
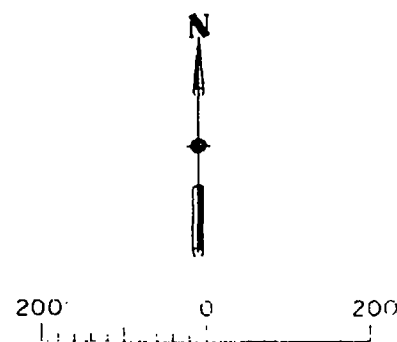


Figure 4-8

Eastern Area Phase II Soil Gas Locations

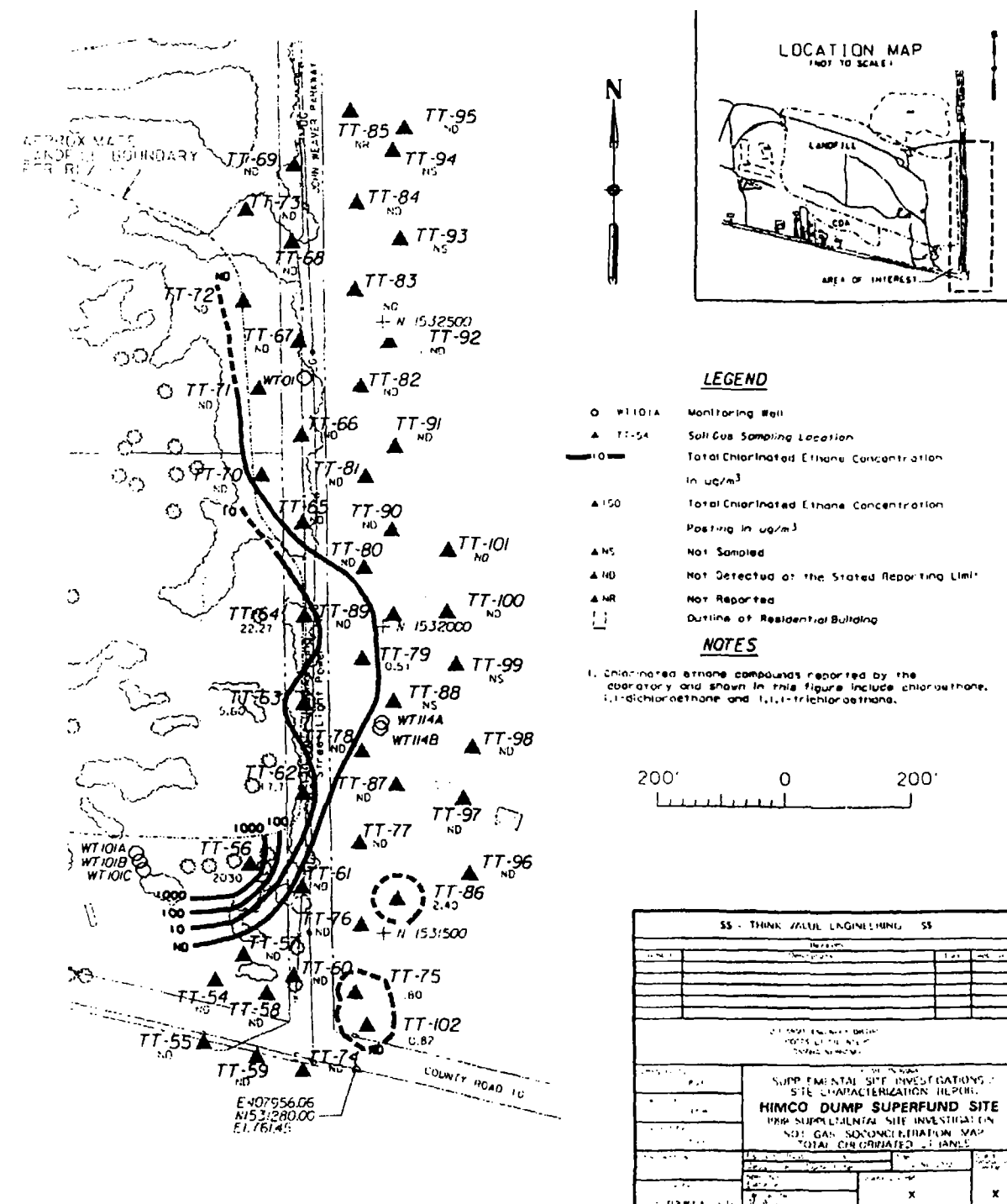


LEGEND

- WT101A Existing Monitoring Well
- ▲ TT-54 Soil Gas Sampling Location
- Outline of Residential Building

SR - THOMAS ENGINEERING		35																								
<table border="1"> <tr> <th>Station</th> <th>Location</th> <th>Date</th> <th>Remarks</th> </tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </table>			Station	Location	Date	Remarks																				
Station	Location	Date	Remarks																							
C. A. ARMY AND NAVY DISTRICT CAMP LEJEUNE P.O. BOX 918 JEFFERSON, N.C. 28540																										
REPORT NUMBER SUPPLEMENTAL SITE INVESTIGATION SITE CHARACTERIZATION REPORT HIMCO DUMP SUPERFUND SITE 1990 SUPPLEMENTAL SITE INVESTIGATION SOIL GAS SAMPLING LOCATION																										
DRAWN BY CHECKED BY APPROVED BY DATE	SCALE DATE PROJECT NO.	SHEET NO. TOTAL SHEETS																								

Figure 4-9



Phase II soil gas sampling detected chlorinated ethanes:

- Chloroethane
- 1,1-trichloroethane
- 1,1-dichloroethane

Figure 4-12

POND

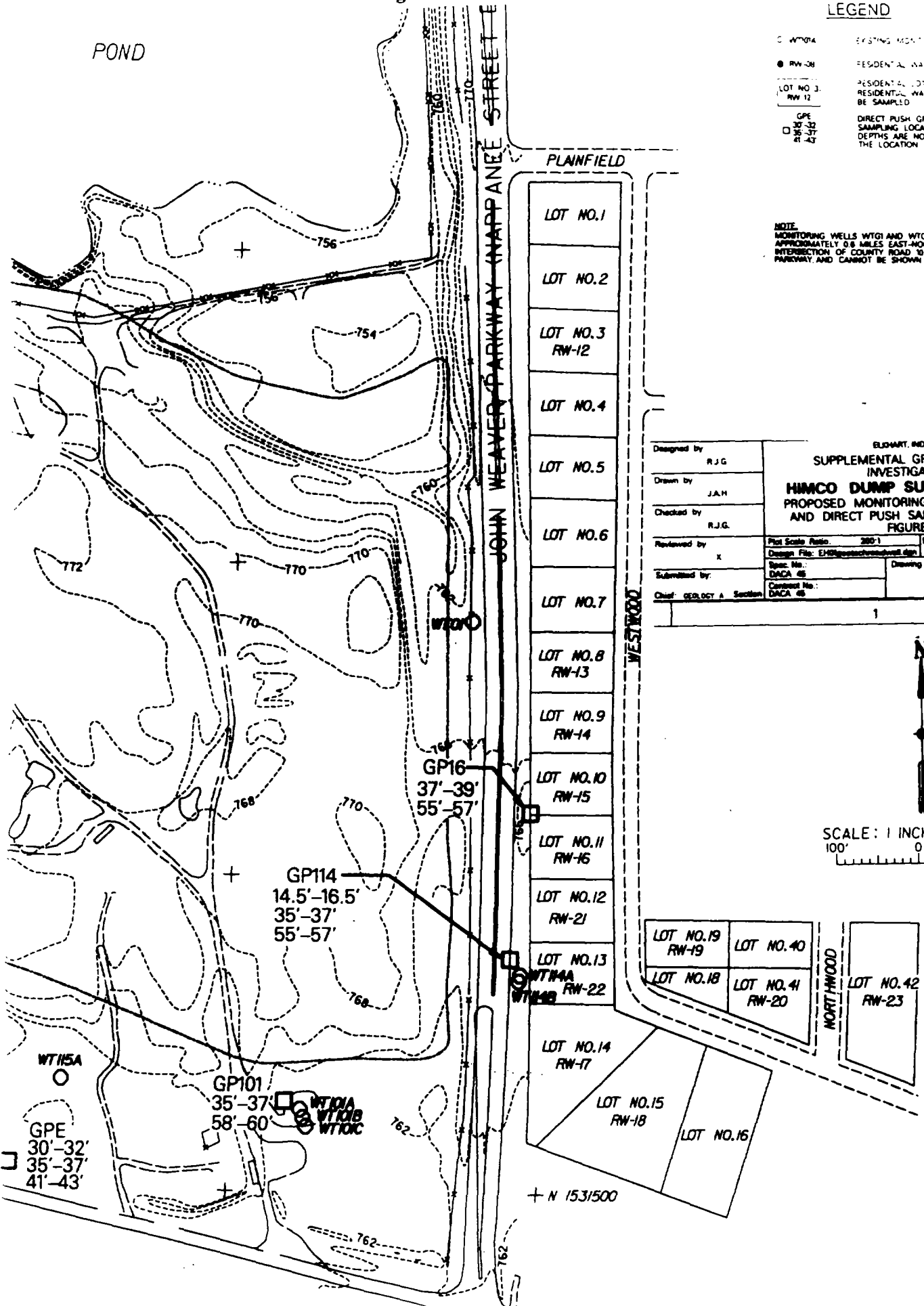
LEGEND

- WT014 EXISTING MONITORING WELL
- RW-08 RESIDENTIAL WATER WELL
- LOT NO. 3
RW-12 RESIDENTIAL LOT NUMBER AND RESIDENTIAL WATER WELL TO BE SAMPLED
- GPE
30'-32'
35'-37'
41'-43' DIRECT PUSH GROUND WATER SAMPLING LOCATION SAMPLING DEPTHS ARE NOTED ADJACENT TO THE LOCATION SYMBOL

NOTE:
MONITORING WELLS WT01 AND WT03 ARE LOCATED APPROXIMATELY 0.8 MILES EAST-NORTHEAST OF THE INTERSECTION OF COUNTY ROAD 18 AND JOHN WEAVER PARKWAY AND CANNOT BE SHOWN ON THIS MAP

ELKHART, INDIANA			
SUPPLEMENTAL GROUND WATER INVESTIGATION			
HIMCO DUMP SUPERFUND SITE			
PROPOSED MONITORING, RESIDENTIAL WELL AND DIRECT PUSH SAMPLING LOCATIONS			
FIGURE 2			
Designed by R.J.G.	Plot Scale Ratio 200:1	Date APRIL, 2000	Sheet reference number
Drawn by J.A.H.	Design File: E:\H2O\scs\res\h2o\fig2.dgn	Drawing Code X	X
Checked by R.J.G.	Spec. No.: DACA 45		
Reviewed by X	Consent No.: DACA 45		
Submitted by:			
Chief: GEOLOGY & SECTION			

SCALE: 1 INCH = 100 FEET
100' 0 100'



LOT NO.1	LOT NO.19 RW-19	LOT NO.40
LOT NO.2	LOT NO.18	LOT NO.41 RW-20
LOT NO.3 RW-12	LOT NO.14 RW-17	LOT NO.42 RW-23
LOT NO.4	LOT NO.15 RW-18	
LOT NO.5	LOT NO.16	
LOT NO.6		
LOT NO.7		
LOT NO.8 RW-13		
LOT NO.9 RW-14		
LOT NO.10 RW-15		
LOT NO.11 RW-16		
LOT NO.12 RW-21		
LOT NO.13 RW-22		
LOT NO.14 RW-17		
LOT NO.15 RW-18		
LOT NO.16		

+ N 153/500

TABLES

Table 1

Summary of Chemicals in Ground Water at Himco Dump Site (1990-2000)

<p>Southern Downgradient Ground Water</p> <p>Basis: well pair: WT116A/WT119A (1990-2000)</p>	<p>Eastern Downgradient Ground Water</p> <p>Basis: WT101A, WT114A, WT114B, GP16 (all depths), GP101 (all depths), GP114 (all depths)</p>	<p>Eastern Residential Wells</p> <p>Basis: Individual Residential Wells</p>
<p><u>Carcinogens</u> arsenic benzene bis(2-ethylhexyl)phthalate carbazole 1,2-DCP vinyl chloride</p>	<p><u>Carcinogens</u> arsenic benzene bis(2-ethylhexyl)phthalate 1,2-DCP</p>	<p><u>Carcinogens</u> arsenic benzene chloroform 1,2-DCA (EDC) 1,2-DCP vinyl chloride</p>
<p><u>Noncarcinogens</u> antimony iron manganese sodium thallium</p>	<p><u>Noncarcinogens</u> chromium iron manganese sodium thallium</p>	<p><u>Noncarcinogens</u> calcium iron manganese sodium sulfate 1,1-DCA cis-1,2-DCE</p>

Table 1-1

Risk Summary for Himco CDA Residential Scenarios

Himco Land Parcel	Carcinogenic Risk			Non-Cancer Hazard Index		
	GW	Soil	Total	GW	Soil	Total
M	3.0E-04	3.0E-05	3.3E-04	46	0.50	46
O	3.0E-04	3.2E-05	3.3E-04	46	0.76	47
<i>N</i>	3.0E-04	1.9E-05*	3.2E-04	46	0.11*	46
P	3.0E-04	2.9E-05	3.3E-04	46	0.71	47
S	3.0E-04	1.1E-04	4.1E-04	46	2.9	49
<i>T</i>	3.0E-04	4.2E-05*	3.4E-04	46	0.31*	46
<i>Q</i>	3.0E-04	8.6E-05*	3.9E-04	46	0.59*	47
<i>R</i>	3.0E-04	4.6E-05*	3.5E-04	46	0.27*	46
F	3.0E-04	1.5E-04	4.5E-04	46	4.5	50
D	3.0E-04	6.4E-05	3.6E-04	46	0.97	47

* No soil samples were collected at Land Parcel N, R, Q and T; soil concentrations were developed by geostatistical methods (krieking) of arsenic and benzopyrene data in order to evaluate the risk. The risks are likely underestimates of soil risks, as only these two contaminants were considered.

Table 2

Himco Residential Ground Water Sampling
Carcinogenic Compounds - Risk for Drinking Water

Compound	Health Effects (ingestion/dermal* exposure)	Conc. Detected ug/L	Risk at Detection Level	MCL/ MCLG (public supplies) ug/L	10 ⁻⁴ Risk Level ug/L
Benzene co-exposure: alcohol	<u>Cancer:</u> blood (leukemia) <u>Noncancer:</u> anemia; decrease in blood platelets; reproductive effects (in animals)	0.4 J 2 residences	1x10 ⁻⁶	5/zero Final	34
Chloroform (TMH) co-exposure: epinephrine (bronchodilators) barbituates	<u>Cancer:</u> liver (in animals) <u>Noncancer:</u> CNS...depression, irritability; kidney; liver: hepatitis, jaundice	0.4 J 1 residence	3x10 ⁻⁵	100/zero 80-Proposed	620
1,2-Dichloroethane (EDC)	<u>Cancer:</u> stomach, liver, lung, mammary, endometrium (in animals) <u>Noncancer:</u> central nervous system; GI; liver; kidney; and lung	0.6 J - 0.7 J 3 residences	5x10 ⁻⁶ - 6x10 ⁻⁶	5/zero Final	12
1,2-Dichloropropane	<u>Cancer:</u> liver, mammary (in animals) <u>Noncancer:</u> CNS; damage to liver, kidney, bladder; testes; lung; and reproductive effects	9 - 10 1 residence	6x10 ⁻⁵	5/zero Final	16
Vinyl Chloride	<u>Cancer:</u> liver, kidney (in animals) <u>Noncancer:</u> damage to sperm and testes; peripheral blood flow (hands)	0.7 J - 0.9 J 2 residences	4x10 ⁻⁵	2/zero Final	2
Arsenic	<u>Cancer:</u> skin, bladder, liver, kidney, prostate, lung <u>Noncancer:</u> nausea, vomiting, diarrhea; anemia; abnormal heartbeat; blood vessel damage; CNS: tingling/hands, feet	5 - 8 4 residences	1x10 ⁻⁴ - 4x10 ⁻⁴	10 Final	4.5

a Region 9 Preliminary Remediation Goals (PRGs) 2002; October 1, 2002.

Risk for Tap Water (ingestion. + inhalation). At <http://www.epa.gov/region09/waste/sfund/prg/index.htm>

MCL/MCLG Values are 2003 (<http://www.epa.gov/safewater/hfacts.html>)

Table 3

**Himco Residential Ground Water Sampling
Non-Carcinogenic Compounds - Risk for Drinking Water**

Compound	Health Effects	Conc. Detected ug/L	HQ at Detection Level	MCL/MCLG (public supplies) ug/L	HQ ^a ug/L
1,1-Dichloroethane	kidney disease; delayed growth (pregnant animals)	0.5 J -12 6 residences			810
cis-1,2-Dichloroethene	blood (decreased # of RBCs); liver	0.5 J - 2 5 residences		70	61
Calcium	infants: milk-alkali syndrome males: urinary stones inhibits absorption of iron, zinc, other nutrients	100,000 - 205,000 J 5+ residences		infants: 60,000 ug/d; UL: over 1 yr: 2,500,000 ug/d	
Iron	GI: abdominal pain; nausea, vomiting; liver damage with iron overload	5,050 - 6,120 3 residences		RDA: infants: 6,000ug/d; 6 mo - 10 yr: 10,000 ug/d	
Manganese	neurological effects: apathy, general weakness, dullness, anorexia, muscle pain	1,560 -1,880 1 residence	1.8 - 2.0	50 UL (adults): 11,000 ug/d	880
Sodium	hypertension	44,400 - 126,000 5 residences		RDA: 1,400,000- 1,500,000 ug/d 20,000 ug/L (low Na diet)	
Sulfate		132,000 - 154,000 6 residences		500,000 (250,000 aesthetics)	

a Region 9 Preliminary Remediation Goals (PRGs) 2002: October 1, 2002;

Risk for Tap Water (ingestion.+ inhalation).

At <http://www.epa.gov/region09/waste/sfund/prg/index.htm>

MCL/MCLG Values are 1996 (<http://www.epa.gov/OST/Tools/dwstds1.html>)

The UL refers to the Upper Intake Limit on the Recommended Dietary Allowance

Table 4

Residential Well Analytical Result Summary - March 2000
Supplemental Site Investigations/Site Characterization Report
Himco Dump Superfund Site
Elkhart, Indiana

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Sample location	54287 Westwood		54287 Westwood		54280 Westwood		54271 Westwood		54215 Westwood		54253 Westwood		54231 Westwood	
2	Sample number	S12		R12		S09		S04		S05		S03		S10	
3	Date sampled	3/16/2000		3/16/2000		3/15/2000		3/15/2000		3/15/2000		3/15/2000		3/15/2000	
4	Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
5		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
6	TOTAL METALS														
7	Arsenic	7		8	J	2	U	2	U	4	U	5	J	2	U
8	Barium	63.8		64.5		72.8		50.4		32.8		128		43.5	
9	Calcium	93300	JB	92300	JB	105000	JB	101000	JB	91800	JB	91500	JB	115000	JB
10	Chromium	3.4	UJ	3.4	UJ	3.4	UJ	3.4	UJ	3.4	UJ	3.4	UJ	3.4	UJ
11	Cobalt	10.5	J	10.1	UJ	10.1	UJ	10.1	UJ	10.1	UJ	10.1	UJ	14	J
12	Copper	7.3	J	4	U	26.1	J	7.3	J	14.2	J	7.3	J	66.1	J
13	Iron	5050		5030		22.4	U	104	BJ	22.4	U	1670		25.3	JB
14	Magnesium	21500		22000		20200		21700		19800		26500		20800	
15	Manganese	63.1		59.6		355		359		3.2	U	213		3.2	J
16	Nickel	19.4	U	19.4	U	19.4	U	19.4	U	21.4	J	19.4	U	19.4	U
17	Potassium	1150		1160		2580		1790		4650		1330		4300	
18	Sodium	14900		14700		65400		22600	J	126000		14500		82500	
19	Zinc	18.9	J	14.2	J	31.5	J	17.4	J	95.6	J	44.3	J	160	J
20	MISC. INORGANICS														
21	Bromide (µg Br/L)	NS		NS		60	J	50	J	NS		60	J	NS	
22	Sulfate (mg SO ₄ /L)	NS		NS		133		138		NS		154		NS	
23	VOLATILE ORGANICS														
24	Sample number	EDCJ5		EDCJ9		EDCK3		EDCK0		EDCK6		EDCK1		EDCK8	
25	Vinyl Chloride	1	U	1	U	1	U	1	U	1	U	1	U	1	U
26	1,1-Dichloroethane	7		7		1	U	0.6	J	1	U	1	U	1	U
27	cis-1,2-Dichloroethene	0.5	J	0.5	J	1	U	1	U	1	U	1	U	1	U
28	Chloroform	1	U	1	U	1	U	1	U	1	U	1	U	1	U
29	1,2-Dichloroethane	0.7	J	1	U	1	U	1	U	1	U	0.6	J	1	U
30	1,2-Dichloropropane	1	U	1	U	1	U	1	U	1	U	1	U	1	U
31	Benzene	0.4	J	0.4	J	1	U	1	U	1	U	1	U	1	U
32	SEMI-VOLATILE ORGANICS														
33	Sample number	EDCJ5		EDCJ9		EDCK3		EDCK0		EDCK6		EDCK1		EDCK8	
34	No Semivolatile Compounds Detected	5	U	5	U	5	U	5	U	5	U	5	U	5	U

U: Analyte Not detected
J: Estimated value
B: Analyte also present in blank
NS: Not Sampled

Table 4 cont.

Residential Well Analytical Result Summary - March 2000
 Supplemental Site Investigations/Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	P	Q	R	S	T	U	V	W	X	Y
1	Sample location	54125 Westwood		54305 Westwood		27919 Westwood		27964 Westwood		27948 Westwood	
2	Sample number	S13		S11		S08		S06		S07	
3	Date sampled	3/16/2000		3/16/2000		3/15/2000		3/15/2000		3/15/2000	
4	Units	µg/L		µg/L		µg/L		µg/L		µg/L	
5		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
6	TOTAL METALS										
7	Arsenic	2	J	4	U	2	U	6	J	7	
8	Barium	108		60.4		28.1		113		102	
9	Calcium	100000	JB	177000	JB	103000	JB	113000	JB	122000	JB
10	Chromium	3.6	JB	3.4	UJ	3.4	UJ	3.4	UJ	3.5	J
11	Cobalt	10.1	UJ	10.1	UJ	10.1	UJ	10.1	UJ	10.1	UJ
12	Copper	5.8	JB	4	U	9	J	11.9	J	4.1	J
13	Iron	885		2170		51.1	JB	5860		6120	
14	Magnesium	21500		18200	J	19000	J	16100	J	16000	J
15	Manganese	284		1560		146		73		72.3	
16	Nickel	19.4	U	19.4	U	19.4	U	19.4	U	19.4	U
17	Potassium	1790		5270		3660		2610		2870	
18	Sodium	17600		44400		56700	J	13500	J	33200	
19	Zinc	10.3	U	17.4	J	20.5	J	19	J	30.1	J
20	MISC. INORGANICS										
21	Bromide (µg Br/L)	NS		70	J	60	J	NS		60	J
22	Sulfate (mg SO ₄ /L)	NS		171		132		NS		146	
23	VOLATILE ORGANICS										
24	Sample number	EDCJ4		EDCK8		EDCK4		EDCK5		EDCK2	
25	Vinyl Chloride	1	U	0.9	J	1	U	1	U	0.7	U
26	1,1-Dichloroethane	1	U	3		0.5	J	2		2	
27	cis-1,2-Dichloroethene	1	U	2		0.6	J	0.8	J	1	
28	Chloroform	1	U	1	U	0.4	J	1	U	1	U
29	1,2-Dichloroethane	1	U	0.6	J	1	U	1	U	1	U
30	1,2-Dichloropropane	1	U	10		1	U	1	U	1	U
31	Benzene	1	U	0.4	J	1	U	1	U	1	U
32	SEMIVOLATILE ORGANICS										
33	Sample number	EDCJ4		EDCK8		EDCK4		EDCK5		EDCK2	
34	No Semivolatile Compounds Detected	5	U	5	U	5	U	5	U	5	U

U: Analyte Not detected

J: Estimated value

B: Analyte also present in blank

NS: Not Sampled

Table 5

**Residential Well Analytical Result Summary - April 2000
Supplemental Site Investigations/Site Characterization Report
Himco Dump Superfund Site
Elkhart, Indiana**

	A	B	C	D	E	F	G	H	I	J	K
1	Sample location	54287 Westwood		54280 Westwood		54271 Westwood		54215 Westwood		54253 Westwood	
2	Sample number	SO1		SO2		SO3		SO6		SO4	
3	Date sampled	4/17/2000		4/17/2000		4/17/2000		4/17/2000		4/17/2000	
4	Units	µg/L		µg/L		µg/L		µg/L		µg/L	
5		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
6	TOTAL METALS										
7	Arsenic	7		2	U	2	U	2	J	5	J
8	Barium	66.6		70.4		57.6		29.1		131	
9	Calcium	88100		102000		110000		83000		90000	
10	Chromium	6.7	U	6.7	U	6.7	U	6.7	U	2	J
11	Copper	31.3	J	11.4	J	14.7	J	13.3	J	34.8	J
12	Iron	5780	J	19.6	JB	86	JB	45.3	JB	1710	J
13	Lead	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
14	Magnesium	20600		20000		24000		19400		27600	
15	Manganese	58.7		325		380		0.6	J	223	
16	Nickel	21	U	21	U	21	U	21	U	21	U
17	Potassium	1100		2430		1880		4000		1280	
18	Sodium	15400	J	83200	J	30300	J	116000	J	15200	J
19	Zinc	34	JB	20.5	JB	13.1	JB	128	B	28.3	JB
20	MISC. INORGANICS										
21	Bromide (µg Br/L)	60	J	60	J	60	J	60	J	60	J
22	Sulfate (mg SO ₄ /L)	142		130		130		127		153	
23	VOLATILE ORGANICS										
24	Sample number	EDPK9		EDPL0		EDPL1		EDPL4		EDPL2	
25	Methylene Chloride	6		2	U	2	U	2	U	2	U
26	1,1-Dichloroethane	12		1	U	0.8	J	1	U	1	U
27	cis-1,2-Dichloroethene	0.8	J	1	U	1	U	1	U	1	U
28	1,2-Dichloropropane	1	U	1	U	1	U	1	U	1	U

U Analyte Not detected
J Estimated value
B: Analyte also present in blank

Table 5 cont.

Residential Well Analytical Result Summary - April 2000
 Supplemental Site Investigations/Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	L	M	N	O	P	Q	R	S	T	U
1	Sample location	54231 Westwood		54125 Westwood		54305 Westwood		54305 Westwood Dup		27919 Westwood	
2	Sample number	SO5		SO7		SO10		SO11		SO8	
3	Date sampled	4/17/2000		4/18/2000		4/18/2000		4/18/2000		4/18/2000	
4	Units	µg/L		µg/L		µg/L		µg/L		µg/L	
5		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
6	TOTAL METALS										
7	Arsenic	2	U	3	J	2	U	2	U	2	U
8	Barium	43.9		109		76.6		63.2		39.3	
9	Calcium	106000		99000		205000		173000		132000	
10	Chromium	6.7	U	6.7	U	6.7	U	6.7	U	2.1	J
11	Copper	7.9	J	9.3	UJ	15.2	J	10.7	J	13.3	J
12	Iron	27.8	JB	1130	J	2790	J	2270	J	100	JB
13	Lead	2.0	U	2.0	U	2.0	J	2.0	U	2.0	U
14	Magnesium	21600		21500		21700		18200		24900	
15	Manganese	1.9	U	299		1880		1560		202	
16	Nickel	21	U	9.8	J	21	U	21	U	21	U
17	Potassium	3850		1760		6920		5170		4140	
18	Sodium	84700	J	19000	J	92200	J	73400	J	81000	J
19	Zinc	173	B	12.5	JB	39.1	B	26.9	JB	26.5	JB
20	MISC. INORGANICS										
21	Bromide (µg Br/L)	60	J	70	J	70	J	70	J	60	J
22	Sulfate (mg SO ₄ /L)	134		132	U	152		152		109	
23	VOLATILE ORGANICS										
24	Sample number	EDPL3		EDPL5		EDPL8		EDPM0		EDPL6	
25	Methylene Chloride	2	U	2	U	2	U	2	U	2	U
26	1,1-Dichloroethane	1	U	1	U	3		4		0.8	J
27	cis-1,2-Dichloroethene	1	U	1	U	2		2		0.7	J
28	1,2-Dichloropropane	1	U	1	U	8		9		1	U

U Analyte Not detected
 J Estimated value
 B Analyte also present in blank

Table 5 cont.

**Residential Well Analytical Result Summary - April 2000
Supplemental Site Investigations/Site Characterization Report
Himco Dump Superfund Site
Elkhart, Indiana**

	A	V	W	X	Y	Z	AA
1	Sample location	27883 Westwood		27964 Westwood		27948 Westwood	
2	Sample number	SO9		SO12		SO13	
3	Date sampled	4/18/2000		4/19/2000		4/19/2000	
4	Units	µg/L		µg/L		µg/L	
5		Result	Qual	Result	Qual	Result	Qual
6	TOTAL METALS						
7	Arsenic	2	U	7	J	8	
8	Barium	35.8		106		92.3	
9	Calcium	99800		112000		97500	
10	Chromium	6.7	U	6.7	U	6.7	U
11	Copper	10.7	J	9.3	UJ	62.1	J
12	Iron	46.5	UJ	5870	J	5530	J
13	Lead	2.0	U	2.0	U	2.0	U
14	Magnesium	21500		15700		13600	
15	Manganese	30		72		65.2	
16	Nickel	21	U	21	U	21	U
17	Potassium	3700		2340		2590	
18	Sodium	91800	J	14800	J	35100	J
19	Zinc	87.3	B	12	JB	31.1	JB
20	MISC. INORGANICS						
21	Bromide (µg Br/L)	60	J	60	J	60	J
22	Sulfate (mg SO ₄ /L)	105		148		142	
23	VOLATILE ORGANICS						
24	Sample number	EDPL7		EDPM1		EDPM2	
25	Methylene Chloride	2	U	UJ	U	2	U
26	1,1-Dichloroethane	1	U	3		2	
27	cis-1,2-Dichloroethene	1	U	1		1	
28	1,2-Dichloropropane	1	U	1	U	1	U

U. Analyte Not detected

J. Estimated value

B. Analyte also present in blank

Table 6

Ground Water Analytical Result Summary - 1996 Supplemental Investigation
 Supplemental Site Investigations/Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Sample location	WT105A		WT111A		WT111A Dup		WT106A		WT115A		WT116A	
2	Sample number	MEAKN2		MEAKN3		MEAKN4		MEAKN5		MEAKN7			
3	Date sampled	11/13/1996		11/13/1996		11/13/1996		11/13/1996		11/13/1996		11/13/1996	
4	Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
5	TOTAL METALS												
6	Aluminum	17.0	U	280.0		267		50.8		32.0		NS	
7	Arsenic	3.0	U	3.7		3.10		5.60		3.0	U	NS	
8	Barium	5.4		105		107		101		33.3		NS	
9	Calcium	38000		8160		8220		146000		215000		NS	
10	Chromium	1.0	U	1.8		1.5		1.0	U	2.9		NS	
11	Cobalt	1.0	U	6.4		6.5		1.0	U	1.6		NS	
12	Copper	1.0	U	3.3		3.0		1.0	U	1.8		NS	
13	Iron	13.1		4470		4360		6080		2220		NS	
14	Lead	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U	NS	
15	Magnesium	10200		2980		2980		18100		36000		NS	
16	Manganese	5.0		335		333		394		276		NS	
17	Nickel	1.0	U	7.2		7.2		1.8		3.8		NS	
18	Potassium	1760		1600		1620		4280		6520		NS	
19	Sodium	4460	J	3200		3270	J	25800	J	33600	J	NS	
20	Thallium	20.00	U	3.00		2.60		2.90		2.20		NS	
21	Vanadium	1.0	U	2.4		2.4		1.0	U	7.6		NS	
22	Zinc	3.6	J	22.2	J	21.2	J	2.9	J	4.1	J	NS	
23	Cyanide	NS		NS		NS		NS		NS		NS	
24	VOLATILE ORGANICS												
25	Sample number	EAXX9		EAXY0		EAXY1		EAXY2		EAXY4		EAXY5	
26	1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	5	J
27	total 1,2-Dichloroethene	10	U	10	U	10	U	3	J	10	U	0.4	J
28	1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	2	J
29	Benzene	10	U	10	U	10	U	10	U	2	J	7	J
30	SEMIVOLATILE ORGANICS												
31	Sample number	EAXX9		EAXY0		EAXY1		EAXY2		EAXY4		EAXY5	
32	bis(2-Ethylhexyl)phthalate	10	U	10	U	10	J	10	U	10	U	NS	

U. Analyte not detected

J. Value is an estimated concentration

NS. Not sampled

Table 7

Ground Water Analytical Results Summary - Fall 1998
 Supplemental Site Investigations/Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
1	Sample location	WT101A	WT101A duplicate	WT102A	WT112A	WT114A	WT115A	WT116A	WT119A	WT119A dup									
2	Date sampled	10/21/1998	10/21/1998	10/19/1998	10/20/1998	10/20/1998	10/21/1998	10/21/1998	10/22/1998	10/22/1998									
3	Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L									
4		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
5	TOTAL METALS																		
6	Aluminum	26.0	U	26.0	U	27.6	J	26.0	UJ	26.0	UJ	94.1	J	58.0	J	258	J	249	J
7	Antimony	42.2	U	42.2	U	42.2	UJ	42.2	UJ	42.2	UJ	42.2	U	42.2	UJ	43.2	BJ	42.2	U
8	Arsenic	3.6	J	3.3	J	0.90	UJ	0.90	UJ	24.3	J	0.90	J	1.0	J	5.8	J	5.3	
9	Barium	91.2	J	85.5	J	47.3	J	36.6	J	238	J	33.5	UJ	192	J	78.3		76.0	
10	Beryllium	0.60	U	0.60	U	0.60	UJ	0.60	UJ	0.60	J	0.60	U	0.60	UJ	0.60	UJ	0.60	UJ
11	Calcium	377000		361000		17100	J	19000	J	27000	J	293000		60900	J	143000		142000	
12	Chromium	13.1		11.3		20.3	J	7.5	J	12.0	J	10.4		7.0	UJ	7.8		7.0	U
13	Cobalt	7.8	U	7.8	U	7.8	UJ	7.8	UJ	11.9	J	7.8	U	7.8	UJ	7.8	U	7.8	U
14	Copper	4.1	U	4.1	U	4.1	UJ	4.1	UJ	4.1	UJ	4.1	U	4.1	UJ	5.4		4.9	
15	Iron	28100		26900		96.8	J	11.7	UJ	17900	J	4590		4490	J	1690		1690	
16	Lead	0.50	U	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ	0.50	U	0.50	UJ	3.4	J	2.4	J
17	Magnesium	14700		13900		16600	J	14000	J	24800	J	20300		52700	J	44800		44500	
18	Manganese	3080		2940		61.5	J	6.7	J	306	J	513		662	J	279		278	
19	Mercury	0.10	U	0.10	U	0.10	J	0.10	UJ	0.10	UJ	0.10	U	0.10	J	0.10	U	0.10	U
20	Nickel	28.3	U	28.3	U	73.0	J	23.8	UJ	23.8	UJ	28.3	U	28.3	UJ	28.3		28.3	U
21	Potassium	3630	J	3630	J	1610	J	1330	J	6640	J	3580	J	25200	J	11500	J	11200	J
22	Selenium	3.0	R	3.0	R	6.0	UJ	6.0	UJ	6.0	UJ	3.0	R	6.0	R	6.0	J	6.0	J
23	Silver	5.3	U	5.3	U	6.1	J	5.3	UJ	5.3	UJ	5.3	U	5.3	UJ	5.3	U	5.3	U
24	Sodium	35800		33100		48000	J	13300	J	47100	J	12100		179000	J	69100		68200	
25	Zinc	3.2	U	3.2	U	3.2	UJ	3.2	UJ	3.2	J	3.7	J	3.2	UJ	4.9	U	4.9	U
26	Cyanide	17.9	J	14.4	J	8.5	J	7.3	J	7.8	J	12.4	J	31.9		12	J	15.2	
27	VOLATILE ORGANICS																		
28	1,1-Dichloroethane	10	U	10	U	10	U	10	U	4	J	10	U	5	J	10	U	10	U
29	SEMIVOLATILE ORGANICS																		
30	Diethylphthalate	19	J	9	J	10	U	10	U	2	J	10	UJ	10	U	10	U	10	U
31	bis(2-Ethylhexyl)phthalate	10	UJ	10	U	3	J	10	U	10	U	10	UJ	2	J	10	U	10	U

U: Analyte not detected

J: Estimated Value

R: Rejected Value (The data value is unusable.)

Table 8

Ground Water Analytical Summary - November 2000
 Supplemental Site Investigations/Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

Sample location	54271 Northwood		54305 Westwood		54305 Westwood Dup		W1116A		W1101A	
Sample number	S01		S02		D02		S03		S04	
Date sampled	11/15-16/2000		11/15-16/2000		11/15-16/2000		11/15-16/2000		11/15-16/2000	
Units	µg/L		µg/L		µg/L		µg/L		µg/L	
	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
TOTAL METALS										
Aluminum	35.9	J	58.2		53.7		335		112	
Arsenic	2	U	4	U	2	U	10	U	6.4	
Barium	48.1		46.9		47.4		133		79.3	
Calcium	102000		129000		129000		745000		227000	
Cobalt	1	U	0.8	J	0.9	JB	1.1		1	U
Copper	2.3		1	J	1.4	JB	2.1		2	U
Iron	60.2		1840		1720		8200		9490	
Lead	2	U	2	U	2	U	2	J	2	U
Magnesium	24800		14200		14200		60000		20200	
Manganese	103		1250		1250		1240		929	
Nickel	2.9	JB	3.4	JB	3.6	JB	4.2	JB	2.3	JB
Potassium	2790		4400		4670		30800		10100	
Sodium	53100		42300		42700		214000		36700	
Zinc	21.7	J	14.3	J	20.3	JB	85.5	J	14.9	JB
MISC. INORGANICS										
Bromide (µg Br/L)	40	J	14	U	30	J	3750	J	320	J
Sulfate (mg SO ₄ /L)	79.3		105		104		1020		177	
Chloride (mg Cl/L)	96.5		99.9		98.4		26		27.2	
VOLATILE ORGANICS										
Ethyl ether	1	U	26		31		100		49	
Dichlorofluoromethane	1	U	5		6		10		6	
1,1-Dichloroethane	1	U	4		4		9		14	
cis-1,2-Dichloroethene	1	U	2		3		1	U	1	U
1,2-Dichloroethane	1	U	1		1		1	U	1	U
Benzene	1	U	1	U	1	U	8		2	
1,2-Dichloropropane	1	U	8		8		2		1	U
SEMIVOLATILE ORGANICS										
Di-n-butylphthalate	4	JB	5	U	14	B	4	JB	4	JB
bis(2-Ethylhexyl)phthalate	5	U	3	J	3	JB	5	U	5	U
2-Hydroxybenzothiazole	10	UJ	10	UJ	10	UJ	23	J	30	UJ

U Not detected

J Estimated value

B Analyte also present in blank

Table 9
Monitoring Well Analytical Detections - April/May 2000
Supplemental Site Investigations/Site Characterization Report
Himco Dump Superfund Site
Elkhart, Indiana

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	Sample location	WTB1		WTB3		WTB4		WTE1		WTE3		WTG1		WTG3		WT101A		WT101A Dup		WT101B		WT101C		WT102A	
2	Sample number	S030		S031		S032		S045		S046		S037		S036		S050		S051		S052		S049		S020	
3	Date sampled	4/26/2000		4/26/2000		4/26/2000		5/2/2000		5/2/2000		4/27/2000		4/27/2000		5/3/2000		5/3/2000		5/3/2000		5/3/2000		4/25/2000	
4	Screened interval (Feet BGS)	468.9-474.9		127.2-137.2		169.2-174.2		73.9-83.9		173.9-178.9		38.0-43.0		162-172		8.5-18.5		8.5-18.5		95.5-100.5		162.5-167.5		8.4-18.4	
5	Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
6		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
7	TOTAL METALS																								
8	Aluminum	118	U	118	U	118	U	118	U	118	U	118	U	36.7	J	118	U	118	U	118	U	152		118	U
9	Arsenic	2	U	5	J	2	U	7	U	5	J	2	U	10		5	J	14	U	7	U	10		2	U
10	Barium	122		60.2		37		43.5		51.3		79.1		79.4		83.1		82.4		72.3		77.6		46.7	
11	Cadmium	0.1	U	0.1	U	0.1	U	0.3	U	0.3	U	0.1	U	0.1	U	0.3	U	0.3	U	0.3	U	0.3	U	0.1	U
12	Calcium	52500		96800		69400		174000		58300		94300		76400		258000		242000		137000		47900		173000	
13	Chromium	2.4	J	6.7	U	6.7	U	6.7	U	6.7	U	6.7	U	6.7	U	6.7	U	6.7	U	6.7	U	7.7	J	17.8	J
14	Cobalt	13.2	U	13.2	U	13.2	U	13.2	U	13.2	U	13.2	U	13.2	U	13.2	U	4	J	13.2	U	4	J	4.1	J
15	Copper	9.3	U	9.3	U	9.3	U	9.3	U	9.3	U	9.3	U	9.3	U	9.3	U	9.3	U	9.3	U	9.3	U	9.3	U
16	Iron	527	JB	426	JB	415	JB	5150		2240		1010	JB	1150	JB	16300		16100		2850		1380		115	JB
17	Lead	2	U	2	U	2	U	3	J	3	J	2	U	2	U	7	U	7	U	7	U	7	U	2	U
18	Magnesium	20900		27900	J	21200	J	35500		23800		24300	J	23500	J	27300		27500		52800		20100		18800	J
19	Manganese	40.1		356		206		204	J	21.1	J	52.7		21.8		1610	J	1540	J	36	J	20.5	J	86.7	
20	Mercury	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
21	Nickel	8.3	J	21	U	21	U	21	U	21	U	7	J	8.1	J	21	U	21	U	21	U	7	J	45.4	J
22	Potassium	2100		1290		759		4120		1810		1430		1260		6730		6810		6280		4130		2060	
23	Selenium	2	U	2	U	2	U	14	U	7	U	2	U	4	J	7	U	7	U	7	U	7	U	2	U
24	Silver	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U
25	Sodium	55100		20300		4600		19100		12400		13800		18400		66800		65200		43100		36100		100000	
26	Vanadium	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U
27	Zinc	36.9	JB	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U
28	MISC INORGANICS																								
29	Bromide (µg Br/L)	180	J	80	J	110	J	120	J	130	J	50	J	60	J	520	J	530	J	340	J	880	J	60	J
30	Sulfate (mg SO ₄ /L)	60	J	132	J	38	J	347		57		59	J	32	J	218		215		211		0.42	J	202	J

NS Not sampled
U Not detected
J Estimated value
R Analyte also present in blank

Table 9 cont.

Monitoring Well Analytical Detections - April/May 2000
 Supplemental Site Investigations/Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
1	Sample location	WTB1		WTB3		WTB4		WTE1		WTE3		WTG1		WTG3		WT101A		WT101A Dup		WT101B		WT101C		WT102A	
2	Sample number	S030		S031		S032		S045		S046		S037		S036		S050		S051		S052		S049		S020	
3	Date sampled	4/26/2000		4/26/2000		4/26/2000		5/2/2000		5/2/2000		4/27/2000		4/27/2000		5/3/2000		5/3/2000		5/3/2000		5/3/2000		4/25/2000	
4	Screened interval (Feet BGS)	468.9-474.9		127.2-137.2		169.2-174.2		73.9-83.9		173.9-178.9		38.0-43.0		162-172		8.5-18.5		8.5-18.5		95.5-100.5		162.5-167.5		8.4-18.4	
5	Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
31	VOLATILE ORGANICS																								
32	Sample number	EDCG3		EDCG4		EDCG5		EOOFH		EOOFJ		EOOF8		EDCG9		ECFN2		ECFN3		ECFN4		EOOF5		EDPN4	
33	Vinyl Chloride	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
34	Chloroethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2		2		1	U	1	U
35	1,1-Dichloroethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	8		8		1	U	1	U	1	U
36	cis-1,2-Dichloroethene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
37	Chloroform	1	U	1	U	1	U	1	U	3		1	U	1	U	1	U	1	U	1	U	1	U	1	U
38	1,2-Dichloropropane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
39	Trichloroethene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
40	Benzene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2		2		1	U	1	U	1	U
41	Bromoform	1	U	1	U	1	U	1	U	1		1	U	1	U	1	U	1	U	1	U	1	U	1	U
42	Tetrachloroethene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
43	SEMI-VOLATILE ORGANICS																								
44	Sample number	EDCG3		EDCG4		EDCG5		EOOFH		EOOFJ		EOOF8		EDCG9		ECFN2		ECFN3		ECFN4		EOOF5		EDPN4	
45	Diethylphthalate	5	U	5	U	5	U	3	J	2	J	5	U	5	U	3	J	4	J	2	J	5	U	5	U
46	Butylbenzylphthalate	5	U	5	U	5	U	4	J	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
47	bis(2-Ethylhexyl)phthalate	5	U	6		5	U	19		35		4	J	19		8		4	J	2	J	2	J	5	U
48	Di-n-octylphthalate	5	U	5	U	5	U	4	J	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U

NS Not sampled
 U Not detected
 J Estimated value
 B Analyte also present in blank

Table 9 cont.

Monitoring Well Analytical Detections - April/May 2000
 Supplemental Site Investigations/Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW
1	Sample location	WT102B		WT102C		WT105A		WT106A		WT111A		WT112A		WT112B		WT112B Dup		WT113A		WT113B		WT114A		WT114A - Split	
2	Sample number	S019		S018		S047		S048		S040		S035		S033		S034		S029		S028		S056		S056	
3	Date sampled	4/25/2000		4/25/2000		5/2/2000		5/2/2000		4/28/2000		4/27/2000		4/27/2000		4/27/2000		4/26/2000		4/26/2000		5/3/2000		5/3/2000	
4	Screened interval (Feet BGS)	62.9-67.9		157-162		8.5-18.5		8.6-18.6		11.9-21.9		7.7-17.7		57.1-62.1		57.1-62.1		14.4-24.4		65.0-70.0		14.5-24.5		14.5-24.5	
5	Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
6		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
7	TOTAL METALS																								
8	Aluminum	118	U	300		112	J	3090		463		118	U	118	U	118	U	118	U	118	U	118	U	44	J
9	Arsenic	6	J	3	J	7	U	46		7	U	2	U	5	J	4	J	2	U	3	J	9		10	J
10	Barium	103		104		8.1		160		256		28.6		86.7		86		13.8		68.4		101		115	
11	Cadmium	0.1	U	0.1	U	0.3	U	0.1	J	0.2	J	0.1	U	0.1	U	0.1	U	0.1	J	0.1	U	0.3	U	2.5	U
12	Calcium	75800		129000		57400		175000		113000		247000		81800		79900		64300		101000		192000		203000	
13	Chromium	24.2	J	26.8	J	23.9	J	21.6	J	2.3	J	6.7	U	6.7	U	6.7	U	6.7	U	6.7	U	6.7	U	10	U
14	Cobalt	13.2	U	13.2	U	4.1	J	13.2	U	12.2	J	13.2	U	13.2	U	13.2	U	13.2	U	13.2	U	5.9	J	5.8	J
15	Copper	9.3	U	4	JB	9.3	U	11		9.3	U	9.3	U	9.3	U	9.3	U	4.2	JB	9.3	U	9.3	U	10	U
16	Iron	1580	JB	2210	JB	407		27600		12600		23.3	JB	1180	JB	1220	JB	59.8	JB	1210	JB	6510		6290	
17	Lead	2	U	2	J	7	U	6	J	7	U	2	U	2	U	2	U	2	U	2	U	7	U	10	U
18	Magnesium	22300		45600		16500	J	26800		19100	J	17000	J	21000	J	20900	J	16500	J	21400		18600	J	21000	
19	Manganese	91.9		288		160	J	559	J	1440	J	0.7	J	93.1		94.5		3.1		97.6		276	J	288	
20	Mercury	0.1	U	0.1	U	0.1	UJ	0.1	UJ	0.1	UJ	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	UJ	0.011	J
21	Nickel	8.1	J	23.7	J	73.3		11.7	J	8.7	J	21	UJ	21	UJ	21	UJ	21	UJ	21	UJ	21	U	4.8	J
22	Potassium	1840		1970		1360		4200		8380		1700		1320		1380		1210		2040		3390		3750	
23	Selenium	2	U	2	U	7	U	7	U	7	U	2	U	2	U	2	U	2	U	2	U	21	U	20	U
24	Silver	3.4	J	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	5	U
25	Sodium	25900		6060		7720		29300		39400		13800		22800		21300		14200		15300		123000		125000	
26	Vanadium	1.9	J	3.2	J	5.1	U	5.1	U	5.1	U	2.3	J	5.1	U	5.1	U	5.1	U	5.1	U	5.1	U	20	U
27	Zinc	34.1	U	13.5	JB	34.1	U	31.7	JB	18	JB	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U	10	U
28	MISC. INORGANICS																								
29	Bromide (µg Br/L)	80	J	140	J	110	J	420	J	430	J	40	J	70	J	70	J	14	U	60	J	170	J	NS	
30	Sulfate (mg SO ₄ /L)	58	J	36	J	36		146		264		434	J	56	J	56	J	24	J	131	J	177		NS	

NS Not sampled

U Not detected

J Estimated value

B Analyte also present in blank

Table 9 cont.

Monitoring Well Analytical Detections - April/May 2000
 Supplemental Site Investigations/ Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW
1	Sample location	WT102B		WT102C		WT105A		WT106A		WT111A		WT112A		WT112B		WT112B Dup		WT113A		WT113B		WT114A		WT114A - Split	
2	Sample number	S019		S018		S047		S048		S040		S035		S033		S034		S029		S028		S056		S056	
3	Date sampled	4/25/2000		4/25/2000		5/2/2000		5/2/2000		4/28/2000		4/27/2000		4/27/2000		4/26/2000		4/26/2000		4/26/2000		5/3/2000		5/3/2000	
4	Screened interval (Feet BGS)	62.9-67.9		157-162		8.5-18.5		8.6-18.6		11.9-21.9		7.7-17.7		57.1-62.1		57.1-62.1		14.4-24.4		65.0-70.0		14.5-24.5		14.5-24.5	
5	Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
31	VOLATILE ORGANICS																								
32	Sample number	EDPN2		EDPN1		EOOFK		EOOF4		EOOFB		EDCG8		EDCG6		EDCG7		EDCG2		EDCG0		EO1TP		EECFN10	
33	Vinyl Chloride	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U
34	Chloroethane	1	U	1	U	1	U	0.6	J	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U
35	1,1-Dichloroethane	1	U	1	U	1	U	0.9	J	1	U	1	U	1	U	1	U	1	U	1	U	3	U	2.6	U
36	cis-1,2-Dichloroethene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U
37	Chloroform	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U
38	1,2-Dichloropropane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U
39	Trichloroethene	1	U	1	U	1	U	0.6	J	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U
40	Benzene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	0.9	J
41	Bromoform	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U
42	Tetrachloroethene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	U
43	SEMIVOLATILE ORGANICS																								
44	Sample number	EDPN2		EDPN1		EOOFK		EOOF4		EOOFB		EDCG8		EDCG6		EDCG7		EDCG2		EDCG0		EO1TP		EECFN10	
45	Diethylphthalate	5	U	5	U	3	J	3	J	5	U	5	U	5	U	5	U	5	U	5	U	1	J	NS	
46	Butylbenzylphthalate	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	NS	
47	bm(2-Ethylhexyl)phthalate	5	U	2	J	17		47		5	U	39		5	U	5	U	5	U	5	U	2	J	NS	
48	Di-n-octylphthalate	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	NS	

NS Not sampled
 U Not detected
 J Estimated value
 B Analyte also present in blank

Table 9 cont.

Monitoring Well Analytical Detections - April/May 2000
 Supplemental Site Investigations/Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO
1	Sample location	WT114B	WT115A	WT116A	WT116A Dup	WT116B	WT117A	WT117B	WT118B	WT119A									
2	Sample number	S037	S043	S053	S054	S035	S038	S039	S041	S042									
3	Date sampled	5/3/2000	5/1/2000	5/3/2000	5/3/2000	5/3/2000	4/27/2000	4/27/2000	4/28/2000	4/28/2000									
4	Screened interval (Feet BGS)	62.8-67.8	9.7-19.7	4.8-14.8	4.8-14.8	55.4-60.4	7.9-17.9	58.5-63.5	59.9-64.9	7.5-17.5									
5	Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L									
6		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
7	TOTAL METALS																		
8	Aluminum	118	U	8360		118	U	118	U	118	U	827		118	U	118	U	38.3	J
9	Arsenic	9		7	U	7	U	7	U	7	U	2	U	2	U	7	U	6	J
10	Barium	69.4		105		79.9		79.6		135		41.3		35.9		93.4		94	
11	Cadmium	0.3	U	0.1	J	0.1	J	0.1	J	0.3	U	0.1	U	0.1	U	0.3	U	0.3	U
12	Calcium	108000		241000		666000		683000		203000		70900		179000		193000		215000	
13	Chromium	3	J	12.8	J	6.7	U	6.7	U	6.7	U	9.3	J	6.7	U	6.7	U	2	J
14	Cobalt	13.2	U	13.2	U	11.2	J	11.5	J	13.2	U	13.2	U	13.2	U	13.2	U	13.2	U
15	Copper	9.3	U	19.7		15.8		15.5		9.3	U	3.2	JB	9.3	U	9.3	U	9.3	U
16	Iron	6320		6500		31900		32400		3710		508	JB	2280	JB	5790		2650	
17	Lead	7	U	11		6	J	13	J	7	U	2	U	2	U	7	U	7	U
18	Magnesium	17500	J	12400	J	66900		66100		22900		12000	J	24200	J	20000		70800	
19	Manganese	92.5	J	380	J	1810	J	1800	J	206	J	206	J	71.7		126	J	318	J
20	Mercury	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	U	0.1	U	0.1	UJ	0.1	UJ
21	Nickel	21	U	11.5	J	13.3	J	12.2	J	21	U	7.5	J	21	UJ	21	U	21	U
22	Potassium	2700		4440		19600		18900		5780		2180		1790		7800		22200	
23	Selenium	7	U	7	U	14	U	14	UJ	14	U	4	U	4	U	14	U	14	U
24	Silver	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U	11.1	U
25	Sodium	14100		24600		161000		160000		23500		5110		17100		18700		61100	
26	Vanadium	5.1	U	14.5		5.1	U	5.1	U	5.1	U	3.1	J	5.1	U	5.1	U	5.1	U
27	Zinc	34.1	U	37.7	JB	178	J	194	J	34.1	U	34.1	U	34.1	U	34.1	U	34.1	U
28	MISC. INORGANICS																		
29	Bromide (µg Br/L)	70	J	620		2380		2420		320	J	60	J	70	J	200	J	460	J
30	Sulfate (mg SO ₄ /L)	156		254		1260		1250		143		169	J	318	J	351		420	

NS Not sampled
 U Not detected
 J Estimated value
 B Analyte also present in blank

Table 9 cont.

Monitoring Well Analytical Detections - April/May 2000
 Supplemental Site Investigations/Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO
1	Sample location	WT114B	WT115A	WT116A	WT116A Dup	WT116B	WT117A	WT117B	WT118B	WT119A									
2	Sample number	S057	S043	S053	S054	S055	S038	S039	S041	S042									
3	Date sampled	5/3/2000	5/1/2000	5/3/2000	5/3/2000	5/3/2000	4/27/2000	4/27/2000	4/28/2000	4/28/2000									
4	Screened interval (Feet BGS)	62.8-67.8	9.7-19.7	4.8-14.8	4.8-14.8	55.4-60.4	7.9-17.9	58.5-63.5	59.9-64.9	7.5-17.5									
5	Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L									
31	VOLATILE ORGANICS																		
32	Sample number	E01TQ	E00FF	ECFN5	ECFN6	ECFN8	E00F9	E00FA	E00FC	E00FE									
33	Vinyl Chloride	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
34	Chloroethane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
35	1,1-Dichloroethane	1	U	1	U	8	7	1	U	1	U	1	U	1	U	2	U	3	U
36	cis-1,2-Dichloroethane	1	U	0.5	J	1	U	1	U	1	U	1	U	1	U	1	U	1	U
37	Chloroform	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
38	1,2-Dichloropropane	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
39	Trichloroethene	1	U	0.6	J	1	U	1	U	1	U	1	U	1	U	1	U	1	U
40	Benzene	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
41	Bromoform	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
42	Tetrachloroethene	1	U	0.8	J	1	U	1	U	1	U	1	U	1	U	1	U	1	U
43	SEMI-VOLATILE ORGANICS																		
44	Sample number	E01TQ	E00FF	ECFN5	ECFN6	ECFN8	E00F9	E00FA	E00FC	E00FE									
45	Diethylphthalate	5	U	2	J	5	U	4	J	2	J	5	U	5	U	5	U	5	U
46	Butylbenzylphthalate	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
47	bis(2-Ethylhexyl)phthalate	1	J	18	7	2	J	2	J	7	U	5	U	5	U	5	U	5	U
48	Di-n-octylphthalate	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U

NS Not sampled
 U Not detected
 J Estimated value
 B Analyte also present in blank

Table 10

Direct-Push Ground Water Analytical Summary-April/May 2000
 Supplemental Site Investigations/ Site Characterization Report
 Himco Dump Superfund Site
 Elkhart, Indiana

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Sample location	GPE-1		GPE-2		GPE-3		GP114-1		GP114-2		GP114-3		GP16-1		GP16-2		GP101-1		GP101-2	
2	Sample number	SO14		SO15		SO16		SO21		SO22		SO23		SO24		SO25		SO26		SO27	
3	Date sampled	4/25/2000		4/25/2000		4/25/2000		4/25/2000		4/25/2000		4/25/2000		4/25/2000		4/25/2000		4/25/2000		4/25/2000	
4	Depth (Foot BGS)	30-32		35-37		41-43		14.5-16.5		35-37		55-57		37-39		55-57		35-37		58-60	
5	Units	µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L		µg/L	
6		Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
7	TOTAL METALS																				
8	Aluminum	2640		3960		3190		118	U	1180		6420		2160		11900		3410		455	
9	Arsenic	5	J	13		5	J	2	U	39		38		7	J	74		17		3	J
10	Barium	99		170		120		80.6		48.4		95.6		45.7		164		118		128	
11	Beryllium	2	U	2	U	2	U	2	U	2	U	2	U	2	U	0.7	JB	2	U	2	U
12	Cadmium	0.1	J	0.2	J	0.1	J	0.1	U	0.1	U	0.3	J	0.1	J	0.6	J	0.2	J	0.1	U
13	Calcium	351000		471000		211000		179000		245000		313000		176000		505000		281000		210000	
14	Chromium	46.5	J	154	J	90.3	J	6.7	U	19.1	J	173	J	38.1	J	124	J	64.4	J	12.6	J
15	Cobalt	5.3	J	9.3	J	8.2	J	13.2	U	13.2	U	14.9	J	7.7	J	20.8	J	10.2	J	13.2	U
16	Copper	23.5	B	55.1		27.9	B	9.3	U	11.5	B	76.3	U	18.4	B	105	U	31.1	B	7.3	JB
17	Iron	19100	JB	38400	JB	17800	JB	337	JB	13400	JB	56300	JB	12800	JB	71400	JB	26400	JB	12000	JB
18	Lead	15		27		12		2	U	9		35		10		47		27		4	J
19	Magnesium	47000		58800		31100		23200		34500		57300		34100		116000		42600		33800	
20	Manganese	751		957		490		500		309		881		563		1820	J	634		356	
21	Mercury	0.1	U	0.2	J	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	J	0.1	U	0.1	U
22	Nickel	26.2	J	38.2	J	22.4	J	21	U	7	J	57.8	J	18.4	J	64.6	J	29.9	J	10.2	J
23	Potassium	8490		12500		9000		3020		2760		4650		3060		4330		6080		6190	
24	Sodium	62200		86300		31500		178000		15300		17300		21600		16300		22800		25200	
25	Vanadium	8.2		7.3		2.5	J	5.1	U	5.1	U	8.8		3.9	J	29.9		6		5.1	U
26	Zinc	94.1	JB	149	JB	86.1	JB	34.1	U	40.7	JB	156	J	43	JB	172	J	82.3	JB	34.3	JB
27	MISC. INORGANICS																				
28	Bromide (µg Br/L)	860	J	1330	J	260	J	170	J	60	J	70	J	40	J	60	J	290	J	170	J
29	Sulfate (mg SO ₄ /L)	389	J	654	J	288	J	167	J	178	J	162	J	72	J	134	J	76	J	97	J
30	VOLATILE ORGANICS																				
31	Sample number	EDPM3		EDPM6		EDPM7		EDPN5		EDPN6		EDPN7		EDCF6		EDCF7		EDCF8		EDCF9	
32	Chloroethane	2		1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	2	
33	Carbon Disulfide	1	U	0.5	J	0.6	J	1	U	1	U	0.5	J	1	U	1	U	0.6	J	1	U
34	1,1-Dichloroethane	0.8	J	1	U	1	U	1	U	4		1	U	1	U	1	U	5		0.8	J
35	cis-1,2-Dichloroethane	1	U	1	U	1	U	1	U	1		0.7	J	1	U	1	U	1	U	1	U
36	1,2-Dichloropropane	0.5	J	1	U	1	U	1	U	2		1	U	2		1	U	1	U	1	U
37	Trichloroethene	1	U	1	U	1	U	1	U	1	U	1	U	0.5	J	1	U	1	U	1	U
38	Benzene	1		2		1	U	1	U	1		0.9	J	1	U	1	U	1		1	U
39	SEMITVOLATILE ORGANICS																				
40	Sample number	EDPM3		EDPM6		EDPM7		EDPN5		EDPN6		EDPN7		EDCF6		EDCF7		EDCF8		EDCF9	
41	Phenol	5	U	5	U	5		5	U	5	U	5	U	5	U	5	U	5	U	5	U
42	bis(2-Ethylhexyl)phthalate	5		5	U	4	J	5	U	5	U	2	J	5	U	5	U	5	U	4	J

U Not detected
 J Estimated value
 B Analyte also present in blank

Table 11

Ground-water wells near Elkhart, Indiana sampled in 2000 and 2002 for selected industrial and household wastewater compounds.

[None, no data or comment; mm/dd/yyyy, date in month, day and year format; hhmm, time in hour and minute, 24 hour format; ug/L micrograms per liter, <, less than; ND, not detected in sample, minimum detection level not reported]

		Station Name					Analytical comments, with blank sample concentrations in parenthesis
		64305 WESTWOOD DRIVE AT ELKHART, IN RESIDENTIAL WELL (Result from duplicate sample, if different, in parenthesis)	HIMCO LF 116A AT ELKHART, IN	HIMCO LF 116A AT ELKHART, IN	USEPA WELL 101A AT HIMCO LANDFILL AT ELKHART, IN	USEPA WELL 115A AT HIMCO LANDFILL AT ELKHART, IN	
Parameter or compound name	Reporting units						
Station Identifier		414218086001101	414216086001701	414216086001701	414215086001702	None	
Collection Date	mm/dd/yyyy	11/15/2000	11/16/2000	10/31/2002	11/16/2000	10/31/2002	
Collection Time	hhmm	1630	1115	1400	1320	1500	
Industrial and Household Wastewater Products							
Acetophenone	ug/L	< 0.220	< 0.220	< 0.500	< 0.220	< 0.500	None
Anthraquinone	ug/L	--	--	< 0.500	--	< 0.500	None
Bis(2-ethyl hexyl) adipate	ug/L	< 2.000	< 2.000	--	< 2.000	--	None
Benzophenone	ug/L	--	--	< 0.500	--	E 0.069	None
5-methyl-1H-benzotriazole	ug/L	< 0.150	0.317	< 2.000	0.303	< 2.000	None
Bromoform	ug/L	--	--	< 0.500	--	< 0.500	None
Butylated hydroxyanisole (BHA)	ug/L	< 0.120	< 0.120	< 5.000	< 0.120	< 5.000	None
Butylated hydroxytoluene (BHT)	ug/L	< 0.110	< 0.110	--	< 0.110	--	None
Caffeine	ug/L	< 0.080	< 0.080	< 0.500	< 0.080	E 4.200	None
Camphor	ug/L	--	--	< 0.500	--	< 0.500	None
Carbazole	ug/L	--	--	< 0.500	--	< 0.500	None
Codeine	ug/L	< 0.200	< 0.200	--	< 0.200	--	None
Cotinine	ug/L	< 0.080	< 0.080	< 1.000	< 0.080	E 0.100	None
p-Cresol	ug/L	< 0.060	0.124	< 1.000	0.072	< 1.000	None
Cumene	ug/L	--	--	E 0.140	--	< 0.500	None
1,4-Dichlorobenzene	ug/L	< 0.040	0.313	E 0.190	0.076	< 0.500	None
3,4-Dichlorophenyl isocyanate	ug/L	--	--	< 0.500	--	< 0.500	None
N,N-Diethyltoluamide (DEET)	ug/L	< 0.080	0.462	E 0.380	0.241	E 0.280	None

Table 11 cont.

Ground-water wells near Elkhart, Indiana sampled in 2000 and 2002 for selected industrial and household wastewater compounds

Parameter or compound name	Reporting units	Station Name					Analytical comments, with blank sample concentrations in parenthesis
		54306 WESTWOOD DRIVE AT ELKHART, IN RESIDENTIAL WELL (Result from duplicate sample, if different, in parenthesis)	HIMCO LF 116A AT ELKHART, IN	HIMCO LF 116A AT ELKHART, IN	USEPA WELL 101A AT HIMCO LANDFILL AT ELKHART, IN	USEPA WELL 116A AT HIMCO LANDFILL AT ELKHART, IN	
Station Identifier		414218086001101	414216086001701	414216086001701	414215086001702	None	
Collection Date	mm/dd/yyyy	11/15/2000	11/16/2000	10/31/2002	11/16/2000	10/31/2002	
Collection Time	hhmm	1630	1115	1400	1320	1500	
Industrial and Household Wastewater Products							
2,6-Dimethylnapthalene	ug/L	--	--	< 0.500	--	< 0.500	None
Ethyl citrate	ug/L	--	--	< 0.500	--	E 0.077	None
Galaxolide (HHCB)	ug/L	--	--	< 0.500	--	E 0.085	None
Indole	ug/L	--	--	< 0.500	--	< 0.500	None
Isoborneol	ug/L	--	--	< 0.500	--	< 0.500	None
Isoquinoline	ug/L	--	--	< 0.500	--	< 0.500	None
d-Limonene	ug/L	--	--	< 0.500	--	< 0.500	None
Menthol	ug/L	--	--	< 0.500	--	E 0.094	None
1-Methylnapthalene	ug/L	--	--	< 0.500	--	< 0.500	None
2-Methylnapthalene	ug/L	--	--	< 0.500	--	< 0.500	None
Methyl salicylate	ug/L	--	--	< 0.500	--	< 0.500	None
Napthalene	ug/L	< 0.025	< 0.025	< 0.500	< 0.025	< 0.500	None
Bisphenol A	ug/L	< 0.090	1.29	E 0.540	0.69	E 0.360	Detected in 2002 equipment rinse blank sample (E 0.1)
4-Cumylphenol	ug/L	--	--	< 1.000	--	< 1.000	None
Pentachlorophenol	ug/L	--	--	< 2.000	--	< 2.000	None
Phenol	ug/L	< 0.450 (E 0.314)	< 0.450	< 0.500	E 0.511	< 0.500	None

Table 11 cont.

Ground-water wells near Elkhart, Indiana sampled in 2000 and 2002 for selected industrial and household wastewater compounds

Parameter or compound name	Reporting units	Station Name					Analytical comments, with blank sample concentrations in parenthesis
		64306 WESTWOOD DRIVE AT ELKHART, IN RESIDENTIAL WELL (Result from duplicate sample, if different, in parenthesis)	HIMCO LF 116A AT ELKHART, IN	HIMCO LF 116A AT ELKHART, IN	USEPA WELL 101A AT HIMCO LANDFILL AT ELKHART, IN	USEPA WELL 115A AT HIMCO LANDFILL AT ELKHART, IN	
Station Identifier		414218086001101	414216086001701	414216086001701	414215086001702	None	
Collection Date	mm/dd/yyyy	11/15/2000	11/16/2000	10/31/2002	11/16/2000	10/31/2002	
Collection Time	hhmm	1630	1115	1400	1320	1500	
Herbicides and Pesticides							
Atrazine	ug/L	--	--	< 0.500	--	< 0.500	None
Bromacil	ug/L	--	--	< 0.500	--	< 0.500	None
Carbaryl	ug/L	< 0.060	< 0.060	< 1.000	< 0.060	< 1.000	None
cis-Chlordane	ug/L	< 0.040	< 0.040	--	< 0.040	--	None
Chlorpyrifos	ug/L	< 0.020	< 0.020	< 0.500	< 0.020	< 0.500	None
Diazinon	ug/L	< 0.030	< 0.030	< 0.500	< 0.030	< 0.500	None
Dichlorvos	ug/L	--	--	< 1.000	--	< 1.000	None
Dieldrin	ug/L	< 0.080	< 0.080	--	< 0.080	--	None
Lindane	ug/L	< 0.050	< 0.050	--	< 0.050	--	None
Metalaxyl	ug/L	--	--	< 0.500	--	< 0.500	None
Metolachlor	ug/L	--	--	< 0.500	--	< 0.500	None
Methyl parathion	ug/L	< 0.060	< 0.060	--	< 0.060	--	None
Prometon	ug/L	--	--	< 0.500	--	< 0.500	None
Polynuclear Aromatic Hydrocarbons							
Anthracene	ug/L	< 0.060	E 0.034	< 0.500	< 0.060	< 0.500	None
Fluoranthene	ug/L	< 0.030	< 0.030	E 0.076	< 0.030	< 0.500	None
Phenanthrene	ug/L	< 0.050	< 0.050	< 0.500	< 0.050	< 0.500	None
Pyrene	ug/L	< 0.030	< 0.030	< 0.500	< 0.030	< 0.500	None
Benz(a)pyrene	ug/L	< 0.070	< 0.070	< 0.500	< 0.070	< 0.500	None

Table 11 cont.

Ground-water wells near Elkhart, Indiana sampled in 2000 and 2002 for selected industrial and household wastewater compounds

Parameter or compound name	Reporting units	Station Name					Analytical comments, with blank sample concentrations in parenthesis
		54306 WESTWOOD DRIVE AT ELKHART, IN RESIDENTIAL WELL (Result from duplicate sample, if different, in parenthesis)	HIMCO LF 116A AT ELKHART, IN	HIMCO LF 116A AT ELKHART, IN	USEPA WELL 101A AT HIMCO LANDFILL AT ELKHART, IN	USEPA WELL 115A AT HIMCO LANDFILL AT ELKHART, IN	
Station Identifier		414218086001101	414216086001701	414216086001701	414215086001702	None	
Collection Date	mm/dd/yyyy	11/15/2000	11/16/2000	10/31/2002	11/16/2000	10/31/2002	
Collection Time	hhmm	1630	1115	1400	1320	1500	
Industrial and Household Wastewater Products							
Nonylphenol monoethoxylate-total (NPEO1)	ug/L	< 1.000	E 0.774	< 5.000	E 0.941	E 3.800	None
Nonylphenol monoethoxylate-total (NPEO2)	ug/L	< 1.100	< 1.100	< 5.000	E 1.460	E 0.890	None
4-n-Octylphenol	ug/L	--	--	< 1.000	--	< 1.000	None
4-tert-Octylphenol	ug/L	--	--	< 1.000	--	< 1.000	None
Octylphenol monoethoxylate (OPEO1)	ug/L	< 0.120	E 0.166	< 1.000	E 0.260	E 0.280	Detected in 2002 laboratory blank sample (E 0.13)
Octylphenol diethoxylate (OPEO2)	ug/L	< 0.200	< 0.200	< 1.000	< 0.200	< 1.000	None
2,6-di-t-Butylphenol	ug/L	< 0.150	< 0.150	--	< 0.150	--	None
p-Nonylphenol-total	ug/L	< 0.700	E 1.450	< 5.000	E 0.330	E 1.800	None
2,6-di-t-p-Benzoquinone	ug/L	< 0.500	E 0.965	--	< 0.500	--	None
Skatol	ug/L	--	--	< 1.000	--	< 1.000	None
Tetrachloroethylene	ug/L	< 0.030	< 0.030	< 0.500	< 0.030	< 0.500	None
Triclosan	ug/L	E 0.040 (E 0.041)	< 0.050	< 1.000	E 0.036	E 0.260	Detected in 2000 laboratory blank sample (E 0.044)
Tonalide (AHTN)	ug/L	--	--	< 0.500	--	E 0.330	None

Table 11 cont.

Ground-water wells near Elkhart, Indiana sampled in 2000 and 2002 for selected industrial and household wastewater compounds

Parameter or compound name	Reporting units	Station Name					Analytical comments, with blank sample concentrations in parenthesis
		54305 WESTWOOD DRIVE AT ELKHART, IN RESIDENTIAL WELL (Result from duplicate sample, if different, in parenthesis)	HIMCO LF 116A AT ELKHART, IN	HIMCO LF 116A AT ELKHART, IN	USEPA WELL 101A AT HIMCO LANDFILL AT ELKHART, IN	USEPA WELL 115A AT HIMCO LANDFILL AT ELKHART, IN	
Station Identifier		414218086001101	414216086001701	414216086001701	414215086001702	None	
Collection Date	mm/dd/yyyy	11/15/2000	11/16/2000	10/31/2002	11/16/2000	10/31/2002	
Collection Time	hhmm	1630	1115	1400	1320	1500	
Industrial and Household Wastewater Products							
Fire Retardants							
Tributylphosphate	ug/L	--	--	0.64	--	E 0.100	None
Tri(2-chloroethyl)phosphate	ug/L	0.649 (0.741)	0.238	E 0.160	0.206	E 0.130	None
Tri(dichlorisopropyl)phosphate	ug/L	< 0.100	< 0.100	E 0.120	< 0.100	< 0.500	None
Ethanol,2-butoxy-,phosphate	ug/L	< 0.200	0.948	E 0.890	0.215	E 0.220	None
PBDE4-1	ug/L	--	--	< 10.000	--	< 10.000	None
PBDE4-2	ug/L	--	--	< 10.000	--	< 10.000	None
PBDE4-3	ug/L	--	--	< 10.000	--	< 10.000	None
PBDE5-1	ug/L	--	--	< 10.000	--	< 10.000	None
PBDE5-2	ug/L	--	--	< 10.000	--	< 10.000	None
PBDE5-3	ug/L	--	--	< 10.000	--	< 10.000	None
PBDE6-1	ug/L	--	--	< 10.000	--	< 10.000	None
PBDE6-2	ug/L	--	--	< 10.000	--	< 10.000	None
Plasticizers							
Diethylphthalate	ug/L	< 0.350	< 0.350	< 0.500	E 5.280	1.2	None
Diethylhexyl phthalate	ug/L	--	--	< 0.500	--	< 0.500	Detected in 2002 laboratory blank sample (E 1.0)
Bis(2-ethylhexyl) phthalate	ug/L	E 3.620 (< 2.500)	E 3.260	--	< 2.500	--	None
Phthalic anhydride	ug/L	< 0.350	< 0.350	--	E 1.150	--	None
Triphenyl phosphate	ug/L	< 0.100	< 0.100	< 0.500	< 0.100	< 0.500	None

Table 11 cont.

Ground-water wells near Elkhart, Indiana sampled in 2000 and 2002 for selected industrial and household wastewater compounds

Parameter or compound name	Reporting units	Station Name					Analytical comments, with blank sample concentrations in parenthesis
		64305 WESTWOOD DRIVE AT ELKHART, IN RESIDENTIAL WELL (Result from duplicate sample, if different, in parenthesis)	HIMCO LF 116A AT ELKHART, IN	HIMCO LF 116A AT ELKHART, IN	USEPA WELL 101A AT HIMCO LANDFILL AT ELKHART, IN	USEPA WELL 115A AT HIMCO LANDFILL AT ELKHART, IN	
Station Identifier		414218086001101	414216086001701	414216086001701	414215086001702	None	
Collection Date	mm/dd/yyyy	11/15/2000	11/16/2000	10/31/2002	11/16/2000	10/31/2002	
Collection Time	hhmm	1630	1115	1400	1320	1500	
Hormones							
3B-Coprostanol	ug/L	< 0.600	< 0.600	E 0.350	< 0.600	E 2.000	None
Cholesterol	ug/L	< 1.500	< 1.500	E 0.640	< 1.500	E 3.700	None
Stigmastanol	ug/L	< 2.000	< 2.000	< 2.000	< 2.000	< 2.000	None
beta-Sitosterol	ug/L	--	--	< 2.000	--	E 1.400	None

Table 12

Ground-water wells near Elkhart, Indiana sampled in 2000 and 2002 for selected pharmaceutical compounds

[None, no data or comment; mm/dd/yyyy, date in month, day and year format; hhmm, time in hour and minute, 24 hour format; ug/L, micrograms per liter; <, less than; ND, not detected in sample, minimum detection level not reported]

		Station Name					Analytical comments, with blank sample concentrations in parenthesis
Parameter or pharmaceutical name	Reporting units	54305 WESTWOOD DRIVE AT ELKHART, IN RESIDENTIAL WELL	HIMCO LF 116A AT ELKHART, IN	HIMCO LF 116A AT ELKHART, IN	USEPA WELL 101A AT HIMCO LANDFILL AT ELKHART, IN	USEPA WELL 116A AT HIMCO LANDFILL AT ELKHART, IN	
Station Identifier		414218086001101	414216086001701	414216086001701	414215086001702	None	
Collection Date	mm/dd/yyyy	11/15/2000	11/16/2000	10/31/2002	11/16/2000	10/31/2002	
Collection Time	hhmm	1630	1115	1400	1320	1500	
Diltiazem	ug/L	< 0.012	< 0.012	< 0.012	< 0.012	< 0.012	None
Enalaprilat	ug/L	< 0.152	< 0.152	--	< 0.152	--	None
Erythromycin	ug/L	--	--	ND	--	ND	None
Fluoxetine	ug/L	< 0.018	< 0.018	< 0.018	E 0.0049	< 0.018	None
Furosemide	ug/L	ND	ND	ND	ND	ND	None
Ibuprofen	ug/L	< 0.018	< 0.018	< 0.018	3.11	< 0.018	None
Gemfibrozil	ug/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	None
Paroxetine metabolite	ug/L	< 0.026	< 0.026	--	< 0.026	--	None
Lisinopril	ug/L	ND	ND	--	ND	--	None
Metformin	ug/L	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	None
Miconazole	ug/L	--	--	ND	--	ND	None
Naproxen	ug/L	--	--	ND	--	ND	None
Salbutamol	ug/L	< 0.029	< 0.029	< 0.029	< 0.029	< 0.029	None
Sulfamethoxazole	ug/L	< 0.023	< 0.023	< 0.023	< 0.023	< 0.023	None
Thiabendazole	ug/L	ND	ND	ND	ND	ND	None
Trimethoprim	ug/L	< 0.014	< 0.014	< 0.014	< 0.014	< 0.014	None
Urobilin	ug/L	ND	ND	--	ND	--	None
Warfarin	ug/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	None

Table 12 cont.

Ground-water wells near Elkhart, Indiana sampled in 2000 and 2002 for selected antibiotic compounds

[mm/dd/yyyy, date in month, day and year format; hhmm, time in hour and minute, 24 hour format; <, less than]

		Station Name		
Parameter or antibiotic name	Reporting units	54305 WESTWOOD DRIVE AT ELKHART, IN RESIDENTIAL WELL	HIMCO LF 116A AT ELKHART, IN	USEPA WELL 101A AT HIMCO LANDFILL AT ELKHART, IN
		414218086001101	414216086001701	414215086001702
Station identifier				
Date	mm/dd/yyyy	11/15/2000	11/16/2000	11/16/2000
Time	hhmm	1630	1115	1320
Carbadox	ug/L	<0.1	<0.1	<0.1
Chlortetracycline	ug/L	<0.05	<0.05	<0.05
Ciprofloxacin	ug/L	<0.02	<0.02	<0.02
Doxycycline	ug/L	<0.1	<0.1	<0.1
Enrofloxacin	ug/L	<0.02	<0.02	<0.02
Erythromycin-H2O	ug/L	<0.05	<0.05	<0.05
Lincomycin	ug/L	<0.05	<0.05	<0.05
Norfloxacin	ug/L	<0.02	<0.02	<0.02
Oxytetracycline	ug/L	<0.1	<0.1	<0.1
Roxithromycin	ug/L	<0.03	<0.03	<0.03
Sarafloxacin	ug/L	<0.02	<0.02	<0.02
Sulfachloropyradizine	ug/L	<0.1	<0.1	<0.1
Sulfadimethoxine	ug/L	<0.05	<0.05	<0.05
Sulfamerazine	ug/L	<0.05	<0.05	<0.05
Sulfamethazine	ug/L	<0.05	<0.05	<0.05
Sulfamethizole	ug/L	<0.1	<0.1	<0.1
Sulfamethoxazole	ug/L	<0.1	<0.1	<0.1
Sulfathiazole	ug/L	<0.1	<0.1	<0.1
Tetracycline	ug/L	<0.05	<0.05	<0.05
Trimethoprim	ug/L	<0.03	<0.03	<0.03
Tylosin	ug/L	<0.05	<0.05	<0.05
Virginiamycin	ug/L	<0.1	<0.1	<0.1

Table 12 cont.

Ground-water wells near Elkhart, Indiana sampled in 2002 for analysis by USEPA, Region 5 Central Regional Laboratory, Chicago, Illinois.

(# #, duplicate sample results; None, no data or comment; ug/L micrograms per liter)

Parameter or compound name	Reporting Units	HIMCO LF 116A AT ELKHART, IN	USEPA WELL 115A AT HIMCO LANDFILL AT ELKHART, IN	Analytical comments with blank sample concentrations in parenthesis
1,4-Dioxane	ug/L	9.2/32	11	None
Tetrahydrofuran	ug/L	7.4/8.7	6.3	None

Table 13

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number Units	SB03-0.5 10/12/1998 MEBOC1 mg/kg			SB03-2 10/12/1998 MEBOC2 mg/kg			SB04-0.5 10/19/1998 MEBQE3 mg/kg			SB04-2 10/19/1998 MEBQE4 mg/kg			SB04-8 10/19/1998 MEBQE5 mg/kg			SB05-0.5 10/19/1998 MEBQE1 mg/kg			SB05-2 10/19/1998 MEBQE2 mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
TOTAL METALS																					
Aluminum	4080			3960			3340			5130			3340			2580			3070		
Antimony	< 11.5	J		< 11.3	J		< 9.0			< 9.0			< 10.3			< 8.9			< 8.8		
Arsenic	1.6			1.3			1.00		J	1.1		J	0.60		J	1.2		J	0.60		J
Barium	27.9			21.9			21.2			39.5			18.7			44.7			34.5		
Beryllium	< 0.20			< 0.20			0.10		J	0.20		J	< 0.10			0.20		J	0.30		J
Cadmium	< 1.0			1.0			< 1.0			< 1.0			< 1.1			1.1			< 1.0		
Calcium	1670		J	480		J	1020			1530			2070			5460			4180		
Chromium	5.2		J	5.3		J	4.8			6.4			5.1			7.0			8.3		
Cobalt	< 3.4			< 3.4			< 1.7			< 1.7			< 1.9			3.2		J	3.1		J
Copper	15.9		J	4.3			3.8		J	3.3		J	3.1		J	18.4			17.1		
Iron	3450			2530			4120			5070			2570			4590			4360		
Lead	9.8			11.7			8.1		J	7.8		J	6.2		J	58.9			22.3		
Magnesium	697		J	333		J	724			833			346			2390			2050		
Manganese	58.7			14.8			69.9			86.2			58.1			109			66.4		
Mercury	< 0.06			< 0.06			0.05		J	0.05		J	< 0.06		J	0.08		J	0.06		J
Nickel	< 8.4			< 8.2			< 6.1			< 6.0			< 6.9		J	6.2		J	12.3		J
Potassium	253		J	< 127			< 198			288		J	< 227			< 195			419		J
Selenium	0.80		J	0.90		J	< 0.10			< 0.10			< 0.10			< 0.10			< 0.10		
Silver	< 0.90			< 0.90			< 1.1			< 1.1			< 1.3			< 1.1			< 1.1		
Sodium	20.4		J	39.0		J	34.5		J	525			110		J	50.2		J	50.6		J
Thallium	< 0.40			< 0.40			< 0.08			< 0.08			< 0.1			< 0.08			< 0.08		
Vanadium	7.8			5.7		J	7.0		J	9.4		J	3.7		J	8.3		J	9.2		J
Zinc	26.0			14.4			15.8			17.3			10.0			72.9			52.4		
Cyanide	0.05		J	0.2		J	< 0.10			0.10		J	0.20		J	0.30		J	0.20		J
VOLATILE ORGANICS																					
Sample Number Units	ECMK2 µg/kg			ECMK3 µg/kg			ECML6 µg/kg			ECML7 µg/kg			ECML8 µg/kg			ECML4 µg/kg			ECML5 µg/kg		
Methylene Chloride	34			< 18			< 11			< 11			< 13			< 11			< 10		
Acetone	2		J	2		J	< 11			< 11			< 13			< 11			< 10		
Carbon Disulfide	< 11			< 11			< 11			< 11			< 13			< 11			< 10		
1,1-Dichloroethane	< 11			< 11			< 11			< 11			< 13			< 11			< 10		
Benzene	< 11			< 11			< 11			< 11			< 13			< 11			< 10		
Ethylbenzene	< 11			< 11			< 11			< 11			< 13			< 11			< 10		
Xylene (total)	< 11			< 11			< 11			< 11			< 13			< 11			< 10		

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number Units	SB06-0.5 10/19/1998 MEBQE6 mg/kg			SB06-0.5 Dup 10/19/1998 MEBQE7 mg/kg			SB06-2 10/19/1998 MEBQE4 mg/kg			SB07-0.5 10/21/1998 MEBQH6 mg/kg			SB07-2 10/21/1998 MEBQH7 mg/kg			SB08-0.5 10/20/1998 MEBQE5 mg/kg			SB08-2 10/20/1998 MEBQE6 mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
TOTAL METALS																					
Aluminum	4220			3000			2770			3100			1730			3150			1900		
Antimony	<	9.4		<	9.4		<	9.0		13.1		J	<	8.7	J	<	8.7		<	8.6	
Arsenic	2.1		J	1.4		J	1.1		J	2.3		J	0.70		J	1.1		J	0.55		J
Barium	51.8			47.7			40.4			13.0			7.8			14.8			126		
Beryllium	<	0.10		<	0.10		0.30		J	0.20		J	0.10		J	<	0.12		<	0.12	
Cadmium	<	1.0		<	1.0		<	1.0		<	1.0		<	0.90		<	0.95		<	0.94	
Calcium	1750			1660			728			1320			2140			953		J	<	6060	
Chromium	4.5			5.5			4.6			6.0			5.1			5.3			5.3		
Cobalt	3.3		J	1.9		J	2.8		J	4.0			1.9			3.3		J	1.9		J
Copper	20.4			19.9			22.8			7.4			8.4			5.3			5.1		J
Iron	6200			4800			3660			5240			4390			4680			2590		
Lead	13.4		J	17.2		J	9.4		J	5.2			6.5		S*	5.4			6.9		J
Magnesium	746			598			470			1140			1160			919		J	1040		
Manganese	337			298			227			133			44.7			105			35.8		
Mercury	<	0.06		<	0.06		<	0.05		<	0.05		<	0.05		0.05		J	<	0.05	
Nickel	9.6		J	7.0		J	<	6.0		8.0			<	5.8		<	5.9		6.7		J
Potassium	219		J	<	205		227		J	234			228			<	192		<	190	
Selenium	<	0.10		<	0.10		<	0.10		<	0.10	J	<	0.10	J	<	0.12		<	0.12	
Silver	<	1.2		<	1.2		<	1.1		<	1.1		<	1.1		<	1.1		<	1.1	
Sodium	24.8		J	<	18.1		32.6		J	41.6			<	16.8		29.9		J	32.7		J
Thallium	<	0.09		<	0.09		<	0.08		0.10		J	<	0.08	J	<	0.08		<	0.08	
Vanadium	8.5		J	7.0		J	5.2		J	8.1			4.7			10.0		J	5.7		J
Zinc	52.3			45.0			41.0			20.2			40.0			15.5			14.9		
Cyanide	0.30		J	<	0.10		<	0.10		0.20		J	<	0.10	J	0.92		J	0.40		J
VOLATILE ORGANICS																					
Sample Number Units		ECML9 µg/kg			ECMM6 µg/kg			ECMM7 µg/kg			ECMP9 µg/kg			ECMQ6 µg/kg			ECMM8 µg/kg			ECMM9 µg/kg	
Methylene Chloride	<	11		<	11		<	11		<	10		<	10		<	10		<	10	
Acetone	<	11		<	11		<	11		<	10		<	10		<	10		<	10	
Carbon Disulfide	<	11		<	11		<	11		<	10		<	10		<	10		<	10	
1,1-Dichloroethane	<	11		<	11		<	11		<	10		<	10		<	10		<	10	
Benzene	<	11		<	11		<	11		<	10		<	10		<	10		<	10	
Ethylbenzene	<	11		<	11		<	11		<	10		<	10		<	10		<	10	
Xylene (total)	<	11		<	11		<	11		<	10		<	10		<	10		<	10	

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number Units	SB09-0.5 10/21/1998 MEBQH3 mg/kg			SB09-0.5 Dup 10/21/1998 MEBQH4 mg/kg			SB09 10/21/1998 MEBQH5 mg/kg			SB10-0.5 10/20/1998 MEBQF7 mg/kg			SB10-0.5 Dup 10/20/1998 MEBQF8 mg/kg			SB10-2 10/20/1998 MEBQF9 mg/kg			SB10-6 10/20/1998 MEBQG0 mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
TOTAL METALS																					
Aluminum	2480			2500			2120			4230			5670			3610			3320		
Antimony	<	9.0		<	8.9		<	8.8		<	9.1		<	9.2		<	8.9		<	9.0	
Arsenic	1.1		J	1.7		J	0.80		J	1.5		J	1.4		J	1.2		J	0.64		J
Barium	14.1		J	13.4		J	12.1		J	51.7			55.1			48.7			24.7		J
Beryllium	<	0.13		<	0.13		<	0.13		<	0.13		<	0.13		<	0.13		<	0.13	
Cadmium	<	0.98		<	0.97		<	0.96		<	0.99		1.2			<	0.97		<	0.99	
Calcium	19800			2650			12800		J	586		J	710		J	361		J	535		J
Chromium	5.7			5.4			5.2			5.5			7.0			5.5			7.6		
Cobalt	3.1		J	2.8		J	2.8		J	3.4		J	3.3		J	3.1		J	<	1.7	
Copper	9.2			9.1			8.0			35.1			37.2			38.1			12.7		
Iron	4750			4610			3620			4780			5330			4290			1330		
Lead	6.7			6.7			6.0		J	21.1		J	28.9		J	16.3		J	8.0		S
Magnesium	2380			1410			3500		J	559		J	766		J	503		J	678		J
Manganese	172			144			62.6			317			319			169			86.6		
Mercury	<	0.05		0.06		J	<	0.05		<	0.05		0.07		J	<	0.05		<	0.05	
Nickel	7.0		J	9.5			<	5.9		8.1		J	8.1		J	<	6.0		<	6.1	
Potassium	264		J	<	196		<	194		<	200		297		J	238		J	<	198	
Selenium	<	0.13		<	0.13	J	<	0.13	J	<	0.13		<	0.13		<	0.13		<	0.13	
Silver	<	1.1		<	1.1		<	1.1		<	1.1		<	1.1		<	1.1		<	1.1	
Sodium	36.2		J	37.6		J	32.6		J	34.3		J	45.5		J	39.3		J	29.8		J
Thallium	<	0.09		<	0.08		<	0.08		<	0.09		<	0.09		<	0.08		0.09		
Vanadium	7.2		J	8.8		J	7.6		J	10.1		J	10.4		J	9.5		J	<	10.9	
Zinc	26.2			22.2			24.1			58.3			68.9			50.1			24.9		
Cyanide	0.58		J	0.37		J	0.58		J	4.2			0.58		J	4.9			0.16		J
VOLATILE ORGANICS																					
Sample Number Units	ECMP6 µg/kg			ECMP7 µg/kg			ECMP8 µg/kg			ECMN0 µg/kg			ECMN1 µg/kg			ECMN2 µg/kg			ECMN3 µg/kg		
Methylene Chloride	<	11		<	10		<	10		<	11		<	11		<	10		<	11	
Acetone	<	11		<	10		<	10		<	11		<	11		<	10		<	11	
Carbon Disulfide	<	11		<	10		<	10		<	11		<	11		<	10		<	11	
1,1-Dichloroethane	<	11		<	10		<	10		<	11		<	11		<	10		<	11	
Benzene	<	11		<	10		<	10		<	11		<	11		<	10		<	11	
Ethylbenzene	<	11		<	10		<	10		<	11		<	11		<	10		<	11	
Xylene (total)	<	11		<	10		<	10		<	11		<	11		<	10		<	11	

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number Units	SB11-0 5 10/21/1998 MEBQH0 mg/kg			SB11-2 10/21/1998 MEBQH1 mg/kg			SB11-6 10/21/1998 MEBQH2 mg/kg			SB12-0 5 10/20/1998 MEBQG7 mg/kg			SB12-2 10/20/1998 MEBQG8 mg/kg			SB12-6 10/20/1998 MEBQG9 mg/kg			SB13-0 5 10/20/1998 MEBQG4 mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
TOTAL METALS																					
Aluminum	4740			3360			4270			2260			1360			2280			3900		
Antimony	< 8.9	J		9.2	J		< 8.8	J		< 8.8	J		< 8.7	J		< 8.8	J		< 9.4	J	
Arsenic	12.5		J	4.7	J		2.8	J		1.1	J		0.70	J		0.9	J		2.1	J	
Barium	102			57.0			55.8			13.8	J		8.0	J		14.2	J		65.8		
Beryllium	0.50	J		0.20	J		0.20	J		0.25	J		< 0.12			< 0.13			0.30	J	
Cadmium	1.1			< 1.0			< 1.0			< 0.96			< 0.95			< 0.96			1.2		
Calcium	21900			26400			7620			1080			2990			1510			9970		
Chromium	12.6			9.2			17.2			5.1			3.3			6.3			8.5		
Cobalt	3.2			3.4			6.8			2.8	J		3.5	J		3.4	J		3.2	J	
Copper	149			46.1			45.9			6.2			4.6	J		12.5			18.9		
Iron	11100			8620			21200			4080			2470			4570			5970		
Lead	160		J	92.9	J		186	J		6.1	J		5.4			7.1	J		167		
Magnesium	5950			11400			2580			853	J		1920			1140			1550		
Manganese	492			278			398			128			47.4			52.9			326		
Mercury	0.20			0.20			0.20			< 0.05			< 0.05			< 0.05			0.10	J	
Nickel	12.0			< 5.9			10.0			< 5.9			< 5.9			< 5.9			8.8	J	
Potassium	462			287			377			< 193			< 192			< 194			423	J	
Selenium	< 0.10	J		< 0.10	J		< 0.10	J		< 0.12			< 0.12			0.13			< 0.10		
Silver	< 1.1			< 1.1			< 1.1			< 1.1			< 1.1			< 1.1			< 1.2		
Sodium	127			54.7			49.1			38.2	J		30.5	J		81.5	J		48.6	J	
Thallium	0.10			< 0.08			< 0.08			< 0.08			< 0.08	J		< 0.08	J		< 0.09		
Vanadium	11.3			8.9			11.3			6.5	J		5.6	J		9.2	J		8.5	J	
Zinc	294			136			109			22.8			15.1			38.9			109		
Cyanide	0.40	J		< 0.10	J		0.30	J		0.17	J		0.18	J		0.25	J		0.50	J	
VOLATILE ORGANICS																					
Sample Number Units	ECMP3 µg/kg			ECMP4 µg/kg			ECMP5 µg/kg			ECMP0 µg/kg			ECMP1 µg/kg			ECMP2 µg/kg			ECMN7 µg/kg		
Methylene Chloride	< 11			< 10			< 10			< 10			< 10			< 10			< 11	J	
Acetone	< 11			< 10			< 10			< 10			< 10			< 10			< 11	J	
Carbon Disulfide	< 11			< 10			< 10			< 10			< 10			< 10			< 11	J	
1,1-Dichloroethane	< 11			< 10			< 10			< 10			< 10			< 10			< 11	J	
Benzene	< 11			< 10			< 10			< 10			< 10			< 10			< 11	J	
Ethylbenzene	< 11			< 10			< 10			< 10			< 10			< 10			11	R	
Xylene (total)	< 11			< 10			< 10			< 10			< 10			< 10			11	R	

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number Units	SB13-2 10/20/1998 MEBQG5 mg/kg			SB13-6 10/20/1998 MEBQG6 mg/kg			SB14-05 10/20/1998 mg/kg			SB14-2 10/20/1998 mg/kg			SB14-6 10/20/1998 mg/kg			SB15-05 10/19/1998 mg/kg			SB15-2 10/19/1998 mg/kg		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
TOTAL METALS																					
Aluminum	3980			3220			4120			4500			2630			3470			2860		
Antimony	<	9.2		<	9.1		<	11.2		<	8.8		<	9.5		<	9.8		<	9.1	
Arsenic	0.90		J	0.90		J	0.83		J	1.1		J	0.60		J	6.0		J	4.4		J
Barium	35.7			33.6			115			36.2		J	43.7		J	102			133		
Beryllium	0.20		J	0.30		J	0.33		J	<	71.3		<	0.14		0.60		J	0.50		J
Cadmium	1.3			<	1.0		<	1.2		<	106.4		<	1.0		1.1			1.2		
Calcium	9300			12000			32700			2840			9350			18400			28800		
Chromium	14.2			12.9			14.6			6.7			15.5			12.9			14.0		
Cobalt	3.9		J	3.3		J	4.3		J	3.0		J	3.0		J	5.1		J	5		J
Copper	14.4			17.0			2110			18.7			25.3			113			283		
Iron	9180			11300			9410			4680			3920			26000			19400		
Lead	58.7			45.6		J	181		J	19.6		J	127		J	895		J	287		
Magnesium	3060			3000			3880			1180			1650			4810			5420		
Manganese	203			220			539			170			184			514			399		
Mercury	0.08		J	0.10		J	0.25		J	0.06		J	0.11		J	0.40			0.50		
Nickel	12.0		J	15.4		J	8.0		J	<	5.9		9.8		J	21.0		J	23.7		J
Potassium	310		J	279		J	278		J	277		J	210		J	363		J	385		J
Selenium	<	0.10	J	0.10			<	0.16	J	<	0.13		<	0.14		<	0.10		<	0.10	
Silver	<	1.1		<	1.1		<	1.4		<	1.1		<	1.2		1.2			2.0		
Sodium	54.7		J	74.3		J	83.7		J	40.5		J	43.0		J	<	65.0	J	60.9		J
Thallium	<	0.09		<	0.09		<	0.11		<	0.08		<	0.09		0.10			<	0.08	
Vanadium	9.8		J	6.0		J	11.3		J	9.9		J	8.0		J	11.1		J	10.2		J
Zinc	175			90.9			181			49.8			249			427			465		
Cyanide	0.30		J	0.90		J	0.14		J	0.12		J	<	0.11		1.1		J	0.90		J
VOLATILE ORGANICS																					
Sample Number Units	ECMN8 µg/kg			ECMN9 µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg		
Methylene Chloride	<	10		<	11		<	12		<	10		<	11		<	11		<	11	
Acetone	<	10		<	11		<	12		<	10		<	11		<	11		22		
Carbon Disulfide	<	10		<	11		<	12		<	10		<	11		<	11		<	11	
1,1-Dichloroethane	<	10		<	11		<	12		<	10		<	11		<	11		<	11	
Benzene	<	10		<	11		<	12		<	10		<	11		<	11		<	11	
Ethylbenzene	<	10		<	11		<	12		<	10		<	11		<	11		<	11	
Xylene (total)	<	10		<	11		<	12		<	10		<	11		<	11		<	11	

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number Units	SB15-8 10/19/1998			SB16-05 10/15/1998			SB16-2 10/15/1998			SB16-8 10/15/1998			SB16-8 Dup 10/15/1998			SB17-0.5 10/15/1998			SB17-2 10/15/1998		
	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual
TOTAL METALS																					
Aluminum	8750			3340			4600			4820			8860			3230			5110		
Antimony	<	9.4		<	10.7	J	<	10.7	J	<	12.8	J	<	13.3	J	<	11.0	J	<	10.9	J
Arsenic	7.0		J	3.9			3.8			4.7			5.5			1.5			2.7		
Barium	112			32.5			55.5			54.3			95.7			29.7			37.4		
Beryllium	0.80		J	<	0.20		<	0.20		0.80		J	0.90		J	<	0.20		<	0.20	
Cadmium	2.0			<	0.90		<	0.90		<	1.10		<	1.10		1.0			<	0.90	
Calcium	31700			14000		J	14800		J	41200			85900		J	6220		J	<	18900	J
Chromium	17.9			7.9		J	9.6			13.1		J	11.3			6.3		J	9.5		
Cobalt	10.8			4.8		J	4.3		J	3.8		J	<	4.0		<	3.3		4.3		J
Copper	2220			16.4			49.0			18.3			18.9			63.9			11.9		
Iron	13500			8530			7460			10800			16600			3760			6680		
Lead	231		J	17.6			32.2			28.2			26.6			19.9			10.9		
Magnesium	22800			4860		J	3530		J	5460		J	7860		J	1440		J	4450		J
Manganese	1410			298			294			228			588			73.3			192		
Mercury	0.10		J	<	0.05		<	0.05		<	0.06		<	0.06		<	0.05		<	0.05	
Nickel	298			10.8			8.8			11.8			12.1			<	8.1		8.0		
Potassium	566		J	289		J	318		J	283		J	450		J	<	125		283		J
Selenium	<	0.10	J	0.60		J	0.70		J	1.4		J	1.3		J	0.80		J	0.80		J
Silver	<	1.2		<	0.80		<	0.80		<	1.0		<	1.1		<	0.90		<	0.90	
Sodium	184		J	29.8		J	78.0			219			378			27.4		J	65.4		
Thallium	<	0.09		<	0.40		0.50			0.50			<	0.50		<	0.40		<	0.40	
Vanadium	17.1			9.9			11.9			<	14.4		15.1			6.9			10.4		
Zinc	1120			66.5			109			78.0			78.6			54.0			26.6		
Cyanide	4.7			0.10		J	0.08		J	1.0			0.50			0.06		J	0.60		
VOLATILE ORGANICS																					
Sample Number Units		µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg	
Methylene Chloride	<	10		<	18		<	24		<	13		<	25		<	20		<	10	
Acetone	<	10		2		J	<	10	J	<	12	J	<	14		3		J	<	10	J
Carbon Disulfide	<	10		<	11		<	10		<	12		2		J	<	11		<	10	
1,1-Dichloroethane	<	10		<	11		<	10		1		J	2		J	<	11		<	10	
Benzene	<	10		<	11		<	10		3		J	4		J	<	11		<	10	
Ethylbenzene	<	10		<	11		<	10		12			14			<	11		<	10	
Xylene (total)	<	10		<	11		<	10		7		J	9		J	<	11		<	10	

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number Units	SB18-0 5 10/19/1998			SB18-2 10/19/1998			SB18-6 10/19/1998			SB19-0 5 10/15/1998			SB19-2 10/15/1998			SB19-6 10/15/1998			SB20-0 5 10/15/1998		
	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual
TOTAL METALS																					
Aluminum	4320			6200			5540			4120			4090			5210			3950		
Antimony	<	9 5		<	9 2		<	10 6		<	11 2	J	<	11 4	J	<	13 8	J	<	11 1	J
Arsenic	1.5		J	4.8		J	3.4		J	3.4			6.1			4.6			5.8		
Barium	81.1			89.8			130			53.5			444			168			172		
Beryllium	0.40		J	0.20		J	0.30		J	<	0 20		<	0 20		<	0 20		<	0 20	
Cadmium	1.0			1.2			<	1 2		<	1 0		<	1 0		<	1 2		<	1 0	
Calcium	4230			13000			14300			5070		J	21700		J	70500		J	69200		J
Chromium	10.5			19.8			11.1			6.9		J	13.1			14.3			25.1		
Cobalt	4.5		J	5.9		J	5.7		J	5.0		J	4.9		J	5.4		J	4.9		J
Copper	41.7			25.6			36.0			50.6			113			48.8			242		
Iron	8960			15000			7950			6700			9130			11200			8700		
Lead	67.4			83.4			86.9			49.8			172			131			161		
Magnesium	1810			4440			3470		J	2050		J	5220		J	12600		J	9940		J
Manganese	474			513			312			373			286			250			592		
Mercury	0.30			0.10		J	0.09		J	0.06			0.20			0.10			27.9		
Nickel	<	6 4		15.0		J	9.4		J	13.5			14.7			11.3			<	16 5	
Potassium	539		J	210		J	328		J	210		J	370		J	586		J	404		J
Selenium	<	0 10		<	0 10		<	0 20		1.0		J	1.6		J	<	0 60		0.60		J
Silver	<	1 2		<	1 2		<	1 3		<	0 90		1.0			<	1 1		1 9		
Sodium	75.7		J	78.2		J	87.1		J	36.2		J	86.3			344			105		
Thallium	<	0 09		<	0 09		<	0 10		<	0 40		<	0 40		<	0 50		<	0 40	
Vanadium	11.2		J	18.0			16.1			<	10 1		12.7			12.7			12.8		
Zinc	103			160			182			81.6			434			307			324		
Cyanide	0.50		J	1.5		J	0.40		J	0.10		J	0.90			0.60			3.3		
VOLATILE ORGANICS																					
Sample Number Units		µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg	
Methylene Chloride	<	11		<	11		<	11		<	19		75			57			<	13	
Acetone	<	11		<	11		<	11		2		J	4		J	7		J	<	11	J
Carbon Disulfide	<	11		<	11		<	11		<	11		<	11		<	15		<	11	
1,1-Dichloroethane	<	11		<	11		<	11		<	11		<	11		<	15		<	11	
Benzene	<	11		<	11		<	11		<	11		<	11		<	15		<	11	
Ethylbenzene	<	11		<	11		<	11		<	11		<	11		<	15		<	11	
Xylene (total)	<	11		<	11		<	11		<	11		<	11		<	15		<	11	

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

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Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number Units	SB20-2 10/15/1998			SB20-6 10/16/1998		
	Result	mg/kg RL	Qual	Result	mg/kg RL	Qual
TOTAL METALS						
Aluminum	4870			3420		
Antimony	<	11.1	J	<	10.9	J
Arsenic	10.8			8.1		
Barium	201			72.2		
Beryllium	<	0.70		0.7		J
Cadmium	1.1			<	0.9	
Calcium	24900		J	28700		J
Chromium	14.0			11.1		
Cobalt	5.4		J	6		J
Copper	664			54.4		
Iron	20600			11500		
Lead	238			105		
Magnesium	7730		J	8990		J
Manganese	454			200		
Mercury	4.5			1.2		
Nickel	22.3			11		
Potassium	483		J	339		J
Selenium	1.3		J	0.7		J
Silver	3.1			1.1		
Sodium	184			92.5		
Thallium	0.50			<	0.4	
Vanadium	15.8			12.9		
Zinc	537			121		
Cyanide	4.3			1.2		
VOLATILE ORGANICS						
Sample Number Units		µg/kg			µg/kg	
Methylene Chloride	<	17		<	11	
Acetone	2		J	2		J
Carbon Disulfide	<	11		<	11	
1,1-Dichloroethane	<	11		<	11	
Benzene	<	11		<	11	
Ethylbenzene	<	11		<	11	
Xylene (total)	<	11		<	11	

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J= Estimated Value

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Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number	SB03-0 5 10/12/1998 ECMK2			SB03-2 10/12/1998 ECMK3			SB04-0 5 10/19/1998 ECML6			SB04-2 10/19/1998 ECML7			SB04-6 10/19/1998 ECML8			SB05-0 5 10/19/1998 ECML4			SB05-2 10/19/1998 ECML5		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
SEMIVOLATILE ORGANICS																					
Units		µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg	
1,2-Dichlorobenzene	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
4-Methylphenol	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Naphthalene	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
2-Methylnaphthalene	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Acenaphthylene	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Acenaphthene	<	360		<	360		<	350		<	350		<	420		<	350	J	<	340	
Dibenzofuran	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Diethylphthalate	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Fluorene	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Phenanthrene	<	360		<	360		<	350		<	350		<	420		46		J	140		J
Anthracene	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Carbazole	<	360	J	<	360	J	<	350		<	350		<	420		<	350		<	340	
Di-n-butylphthalate	<	360		<	360		<	350		<	350		<	420	J	<	350		<	340	
Fluoranthene	<	360		<	360		<	350		<	350		<	420		130		J	210		J
Pyrene	<	360		<	360		<	350		<	350		<	420		140		J	210		J
Butylbenzylphthalate	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Benzo(a)anthracene	<	360		<	360		<	350		<	350		<	420		75	75	J	120		J
Chrysene	<	360		<	360		<	350		<	350		<	420		84	84	J	110		J
bis(2-Ethylhexyl)phthalate	140		J	<	360	J	<	350		<	350		<	420		<	350		420		
Di-n-octylphthalate	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Benzo(b)fluoranthene	<	360		<	360		<	350		<	350		<	420		110		J	140		J
Benzo(k)fluoranthene	<	360		<	360		<	350		<	350		<	420		<	350		38		J
Benzo(a)pyrene	<	360		<	360		<	350		<	350		<	420		89	89	J	110		J
Indeno(1,2,3-cd)pyrene	<	360		<	360		<	350		<	350		<	420		79		J	62		J
Dibenz(a,h)anthracene	<	360		<	360		<	350		<	350		<	420		<	350		<	340	
Benzo(g,h,i)perylene	<	360		<	360		61		J	50		J	74		J	110		J	78		J

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J= Estimated Value

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Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number	SB06-0.5 10/19/1998 ECML9			SB06-0.5 Dup 10/19/1998 ECMM8			SB06-2 10/19/1998 ECMM7			SB07-0.5 10/21/1998 ECMP9			SB07-2 10/21/1998 ECMQ8			SB08-0.5 10/20/1998 ECMM8			SB08-2 10/20/1998 ECMM9		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
SEMIVOLATILE ORGANICS																					
Units		µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg	
1,2-Dichlorobenzene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
4-Methylphenol	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Naphthalene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
2-Methylnaphthalene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Acenaphthylene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Acenaphthene	<	360		<	370		<	350		<	340	J	<	340		<	350		<	340	
Dibenzofuran	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Diethylphthalate	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Fluorene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Phenanthrene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Anthracene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Carbazole	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Di-n-butylphthalate	<	360	J	<	370	J	<	350	J	<	340	J	<	340	J	<	350		<	340	
Fluoranthene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Pyrene	<	360		<	370		<	350		<	340	J	<	340		<	350		<	340	
Butylbenzylphthalate	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Benzo(a)anthracene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Chrysene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
bis(2-Ethylhexyl)phthalate	<	360		<	370		460			690		J	700		J	<	360		<	1500	
Di-n-octylphthalate	<	360		<	370		<	350		<	340	J	<	340	J	<	350		<	340	
Benzo(b)fluoranthene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Benzo(k)fluoranthene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Benzo(a)pyrene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Indeno(1,2,3-cd)pyrene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Dibenz(a,h)anthracene	<	360		<	370		<	350		<	340		<	340		<	350		<	340	
Benzo(g,h,i)perylene	<	360		250		J	<	350		<	340		<	340		<	350		<	340	

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

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Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number	SB09-0.5 10/21/1998 ECMP6			SB09-0.5 Dup 10/21/1998 ECMP7			SB09 10/21/1998 ECMP8			SB10-0.5 10/20/1998 ECMN0			SB10-0.5 Dup 10/20/1998 ECMN1			SB10-2 10/20/1998 ECMN2			SB10-6 10/20/1998 ECMN3		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
SEMIVOLATILE ORGANICS																					
Units	µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg		
1,2-Dichlorobenzene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
4-Methylphenol	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Naphthalene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
2-Methylnaphthalene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Acenaphthylene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Acenaphthene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Dibenzofuran	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Diethylphthalate	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Fluorene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Phenanthrene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Anthracene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Carbazole	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Di-n-butylphthalate	<	350	J	<	350	J	<	350	J	<	360		<	360		<	340		<	350	
Fluoranthene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Pyrene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Butylbenzylphthalate	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Benzo(a)anthracene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Chrysene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
bis(2-Ethylhexyl)phthalate	440		J	470		J	2800		J	140		J	150		J	71		J	<	350	
Di-n-octylphthalate	<	350	J	<	350	J	<	350	J	58		J	70		J	<	340		<	350	
Benzo(b)fluoranthene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Benzo(k)fluoranthene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Benzo(a)pyrene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Indeno(1,2,3-cd)pyrene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Dibenz(a,h)anthracene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	
Benzo(g,h,i)perylene	<	350		<	350		<	350		<	360		<	360		<	340		<	350	

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number	SB11-0.5 10/21/1998 ECMP3			SB11-2 10/21/1998 ECMP4			SB11-6 10/21/1998 ECMP5			SB12-0.5 10/20/1998 ECMP0			SB12-2 10/20/1998 ECMP1			SB12-6 10/20/1998 ECMP2			SB13-0.5 10/20/1998 ECMN7		
	Result	RL	Qual.	Result	RL	Qual.	Result	RL	Qual.	Result	RL	Qual.	Result	RL	Qual.	Result	RL	Qual.	Result	RL	Qual.
SEMIVOLATILE ORGANICS																					
Units	µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg		
1,2-Dichlorobenzene	<	360		<	340		<	340		<	350		<	340		<	690		<	370	
4-Methylphenol	<	360		<	340		<	340		<	350		<	340		<	690		<	370	
Naphthalene	<	360		<	340		<	340		<	350		<	340		<	690		<	370	
2-Methylnaphthalene	<	360		<	340		<	340		<	350		<	340		<	690		<	370	
Acenaphthylene	<	360		<	340		<	340		<	350		<	340		<	690		<	370	
Acenaphthene	<	360		160		J	<	340		<	350		<	340		<	690		<	370	
Dibenzofuran	<	360		78		J	<	340		<	350		<	340		<	690		<	370	
Diethylphthalate	<	360		<	340		<	340		<	350		<	340		<	690		<	370	
Fluorene	<	360		160		J	<	340		<	350		<	340		<	690		<	370	
Phenanthrene	<	200	J	3300			<	340		<	350		<	340		<	690		<	370	
Anthracene	<	360		480			<	340		<	350		<	340		<	690		<	370	
Carbazole	<	360		210		J	<	340		<	350		<	340		<	690		<	370	
Di-n-butylphthalate	<	360	J	<	340		<	340	J	<	350		<	340		<	690		<	370	
Fluoranthene	400			4600			51		J	<	350		<	340		<	690		100		J
Pyrene	470			3800			<	340		<	350		<	340		<	690		110		J
Butylbenzylphthalate	<	360		<	340		<	340		<	350		<	340		<	690		<	370	
Benzo(a)anthracene	280		J	1500			42		J	<	350		<	340		<	690		64		J
Chrysene	320		J	1400			51		J	<	350		<	340		<	690		72		J
bis(2-Ethylhexyl)phthalate	42		J	74		J	39		J	440		J	290		J	3400			160		J
Di-n-octylphthalate	<	360	J	<	340	J	<	340	J	<	350		<	340		<	690		<	370	
Benzo(b)fluoranthene	560			1900			75		J	<	350		<	340		<	690		93		J
Benzo(k)fluoranthene	150		J	580			<	340		<	350		<	340		<	690		370		
Benzo(a)pyrene	430			1500			57		J	<	350		<	340		<	690		66		J
Indeno(1,2,3-cd)pyrene	540			490			48		J	<	350		<	340		<	690		57		J
Dibenz(a,h)anthracene	140		J	130		J	<	340		<	350		<	340		<	690		370		
Benzo(g,h,i)perylene	710			470			63		J	<	350		<	340		<	690		81		J

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number	SB13-2 10/20/1998 ECMN8			SB13-6 10/20/1998 ECMN9			SB14-0.5 10/20/1998			SB14-2 10/20/1998			SB14-6 10/20/1998			SB15-0.5 10/19/1998			SB15-2 10/19/1998		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
SEMIVOLATILE ORGANICS																					
Units	µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg		
1,2-Dichlorobenzene	<	350		<	360		<	400		<	340		<	370		<	370		<	350	
4-Methylphenol	<	350		<	360		<	400		<	340		<	370		<	370		<	350	
Naphthalene	<	350		<	360		<	400		<	340		120		J	<	370		<	350	
2-Methylnaphthalene	<	350		<	360		<	400		<	340		<	370		<	370		<	350	
Acenaphthylene	<	350		<	360		<	400		<	340		<	370		<	370		<	350	
Acenaphthene	<	350		<	360		<	400		<	340		<	370		73		J	<	350	
Dibenzofuran	<	350		<	360		<	400		<	340		<	370		<	370		<	350	
Diethylphthalate	<	350		<	360		<	400		<	340		<	370		<	370		<	350	
Fluorene	<	350		<	360		<	400		<	340		<	370		<	370		<	350	
Phenanthrene	<	350		<	360		<	400		<	340		<	370		360		J	280		J
Anthracene	<	350		<	360		<	400		<	340		<	370		83		J	53		J
Carbazole	<	350		<	360		<	400		<	340		<	370		37		J	<	350	
Di-n-butylphthalate	<	350		<	360		<	400		<	340		<	370		<	370	J	<	350	J
Fluoranthene	<	350		43		J	59		J	<	340		44		J	730			450		
Pyrene	<	350		44		J	64		J	40		J		53	J	900			540		
Butylbenzylphthalate	<	350		<	360		54		J	<	340		<	370		<	370		<	350	
Benzo(a)anthracene	<	350		<	360		41		J	<	340		<	370		820			260		J
Chrysene	<	350		<	360		59		J	<	340		<	370		780			270		J
bis(2-Ethylhexyl)phthalate	150		J	960			190		J	2900			30000			<	370		<	350	
Di-n-octylphthalate	<	350		<	360		<	400		<	340		<	370		<	370		<	350	
Benzo(b)fluoranthene	<	350		38		J	82		J	<	340		52		J	1600			390		
Benzo(k)fluoranthene	<	350		<	360		400			<	340		<	370		400			140		J
Benzo(a)pyrene	<	350		<	360		53		J	<	340		<	370		1000			290		J
Indeno(1,2,3-cd)pyrene	<	350		<	360		48		J	<	340		<	370		1200			230		J
Dibenz(a,h)anthracene	<	350		<	360		400			<	340		<	370		320		J	57		J
Benzo(g,h,i)perylene	<	350		<	360		88		J	<	340		38		J	1500			310		J

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number	SB15-6 10/19/1998			SB16-05 10/15/1998			SB16-2 10/15/1998			SB16-8 10/15/1998			SB16-6 Dup 10/15/1998			SB17-0 5 10/15/1998			SB17-2 10/15/1998		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
SEMIVOLATILE ORGANICS																					
Units	µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg		
1,2-Dichlorobenzene	<	330		<	350		<	350		98		J	63		J	<	360		<	350	
4-Methylphenol	<	330		<	350		<	350		<	410		<	390		<	360		<	350	
Naphthalene	38		J	<	350		<	350		120		J	130		J	<	360		<	350	
2-Methylnaphthalene	<	330		<	350		<	350		<	410		<	390		<	360		<	350	
Acenaphthylene	67		J	<	350		<	350		<	410		<	390		<	360		<	350	
Acenaphthene	<	330		<	350		<	350		<	410		<	390		<	360	J	<	350	
Dibenzofuran	<	330		<	350		<	350		<	410		<	390		<	360		<	350	
Diethylphthalate	<	330		<	350		<	350		64		J	46		J	<	360		<	350	
Fluorene	<	330		<	350		<	350		<	410		<	390		<	360		<	350	
Phenanthrene	170		J	37		J	100		J	270		J	250		J	380			83		J
Anthracene	41		J	<	350		<	350		53		J	57		J	59		J	<	350	
Carbazole	<	330		<	350		<	350		<	410		<	390		64		J	<	350	
Di-n-butylphthalate	<	330		<	350		<	350		<	410		390			<	360		<	350	
Fluoranthene	360			91		J	210		J	710			<	660		760			150		J
Pyrene	430			76		J	190		J	670			610			510		J	120		J
Butylbenzylphthalate	<	330		<	350		<	350		80		J	<	390		<	360	J	<	350	J
Benzo(a)anthracene	250		J	39		J	100		J	400		J	350		J	260		J	66		J
Chrysene	280		J	47		J	110		J	450			400			330		J	76		J
bis(2-Ethylhexyl)phthalate	<	330		410		J	160		J	270		J	120		J	51		J	36		J
Di-n-octylphthalate	<	330		<	350		<	350		<	410		<	390		<	360	J	<	350	J
Benzo(b)fluoranthene	480			44		J	120		J	750			430			280		J	55		J
Benzo(k)fluoranthene	140		J	50		J	120		J	900			440			340		J	77		J
Benzo(a)pyrene	430			53		J	120		J	530			450			280		J	62		J
Indeno(1,2,3-cd)pyrene	400			41		J	82		J	380		J	360		J	270		J	58		J
Dibenz(a,h)anthracene	99		J	350			43		J	160		J	150		J	120		J	350		J
Benzo(g,h,i)perylene	550			39		J	89		J	280		J	250		J	220		J	47		J

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number	SB18-0 5 10/19/1998			SB18-2 10/19/1998			SB18-6 10/19/1998			SB19-0 5 10/15/1998			SB19-2 10/15/1998			SB19-6 10/15/1998			SB20-0 5 10/15/1998		
	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual	Result	RL	Qual
SEMIVOLATILE ORGANICS																					
Units	µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg			µg/kg		
1,2-Dichlorobenzene	<	370		<	360		<	370		<	360		<	370		<	490		<	360	
4-Methylphenol	<	370		<	360		<	370		<	360		<	370		<	490		<	360	
Naphthalene	<	370		50		J	<	370		<	360		<	370		<	490		<	360	
2-Methylnaphthalene	<	370		48		J	<	370		<	360		<	370		<	490		<	360	
Acenaphthylene	<	370		83		J	<	370		96		J	290		J	<	490		<	360	
Acenaphthene	<	370		37		J	<	370		<	360		<	370		<	490		180		J
Dibenzofuran	<	370		<	360		<	370		<	360		<	370		<	490		<	360	
Diethylphthalate	<	370		<	360		<	370		<	360		<	370		<	490		<	360	
Fluorene	<	370		44		J	<	370		<	360		71		J	<	490		<	360	
Phenanthrene	320		J	590			86		J	160		J	450			190		J	460		
Anthracene	67		J	130		J	<	370		78		J	170		J	<	490		110		J
Carbazole	46		J	49		J	<	370		<	360		49		J	<	490		58		J
Di-n-butylphthalate	<	370		<	360		<	370		95		J	37		J	<	490		<	360	
Fluoranthene	510			1200			130		J	490			1700			490			1200		
Pyrene	470			1500			170		J	530			1900			420		J	1200		
Butylbenzylphthalate	<	370		<	360		<	370		<	360	J	<	370	J	<	490	J	<	360	J
Benzo(a)anthracene	<	270		770			77		J	310		J	1100			330		J	780		
Chrysene	<	270		780			100		J	300		J	970			380		J	880		
bis(2-Ethylhexyl)phthalate	<	370		<	360		<	370		73		J	160		J	170		J	90		J
Di-n-octylphthalate	<	370		<	360		<	370		<	360	J	<	370	J	130		J	120		J
Benzo(b)fluoranthene	410			1000			100		J	380			1700			690			1200		
Benzo(k)fluoranthene	89		J	340		J	370			360			2100			830			1200		
Benzo(a)pyrene	280		J	900			89		J	430			1400			480		J	1300		
Indeno(1,2,3-cd)pyrene	200		J	720			54		J	370			1100			410		J	1200		
Dibenz(a,h)anthracene	58		J	200		J	370			130		J	360		J	140		J	450		
Benzo(g,h,i)perylene	240		J	820			93		J	340		J	940			400		J	1000		

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13 cont.

Construction Debris Area Soil Analytical Results - October 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample location Date sampled Sample Number	SB20-2 10/15/1998			SB20-8 10/16/1998		
	Result	RL	Qual	Result	RL	Qual
SEMIVOLATILE ORGANICS						
Units		$\mu\text{g/kg}$			$\mu\text{g/kg}$	
1,2-Dichlorobenzene	<	360		<	350	
4-Methylphenol	50		J	<	350	
Naphthalene	290		J	2200		
2-Methylnaphthalene	180		J	1000		
Acenaphthylene	140		J	2300		
Acenaphthene	220		J	890		
Dibenzofuran	170		J	1500		
Diethylphthalate	<	360		<	350	
Fluorene	250		J	2500		
Phenanthrene	1900			18000		
Anthracene	450			4900		J
Carbazole	280		J	1500		
Di-n-butylphthalate	<	360		<	350	
Fluoranthene	2100			29000		
Pyrene	2500			21000		
Butylbenzylphthalate	<	360	J	<	350	J
Benzo(a)anthracene	1700			9700		
Chrysene	1400			9700		
bis(2-Ethylhexyl)phthalate	82		J	81		J
Di-n-octylphthalate	<	360		<	350	J
Benzo(b)fluoranthene	2800			9700		
Benzo(k)fluoranthene	1200			10000		
Benzo(a)pyrene	1700			11000		
Indeno(1,2,3-cd)pyrene	1200			8400		
Dibenz(a,h)anthracene	450			2000		
Benzo(g,h,i)perylene	1100			7100		

RL = Reporting Limit (For this data set the Reporting Limit is the Contract Required Quantitation Limit)

J= Estimated Value

R=Rejected Value (The data is unusable)

Table 13-1

Soil Gas Analytical Results - November 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-11		TT-12		TT-13		TT-14			TT-14 Duplicate		TT-15	
Units	$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$			$\mu\text{g}/\text{m}^3$		$\mu\text{g}/\text{m}^3$	
Analyte	Result	RL	Result	RL	Result	RL	Result	RL	Qual	Result	RL	Result	RL
Vinyl Chloride	<	0.26	<	0.24	<	33	77		J	100		<	0.47
Bromomethane	<	0.52	<	0.48	<	66	1.0			<	64	<	0.94
Chloroethane	<	0.26	<	0.24	200		36			<	32	<	0.47
1,1-Dichloroethene	<	0.26	<	0.24	<	33	6.8			<	32	<	0.47
Carbon Disulfide	1.2		<	0.24	<	33	86		J	130		<	2.8
Acetone	<	2.6	<	2.4	<	330	<	2.30		<	320	<	4.70
Methylene Chloride	<	0.26	<	0.24	<	33	6.8		J	<	32	<	0.47
trans-1,2-Dichloroethene	<	0.26	<	0.24	<	33	12			<	32	<	0.47
1,1-Dichloroethane	<	0.26	<	0.24	470		500		J	2400		<	0.47
2-Butanone	<	2.6	<	2.4	<	330	<	2.30		<	320	<	4.70
Chloroform	<	0.26	<	0.24	<	33	<	0.23		<	32	<	0.47
1,1,1-Trichloroethane	<	0.26	<	0.24	<	33	250		J	300		<	0.47
Carbon Tetrachloride	<	0.26	<	0.24	<	33	40			<	32	<	0.47
Benzene	1.8		1.4		470		180		J	200		<	2.07
1,2-Dichloroethane	<	0.26	<	0.24	<	33	<	0.23		<	32	<	0.47
Trichloroethene	<	0.26	<	0.24	<	33	270		J	270		<	0.47
1,2-Dichloropropane	<	0.26	<	0.24	<	33	25			<	32	<	0.47
trans-1,3-Dichloropropene	<	0.26	<	0.24	<	33	<	0.23		<	32	<	0.47
Toluene	<	0.26	<	0.24	230		95		J	91		0.89	
cis-1,3-Dichloropropene	<	0.26	<	0.24	<	33	<	0.23		<	32	<	0.47
Tetrachloroethene	<	0.26	<	0.24	<	33	230		J	260		<	0.47
2-Hexanone	<	0.26	<	0.24	<	33	<	0.23		<	32	<	0.47
Chlorobenzene	<	0.26	<	0.24	<	33	11			<	32	<	0.47
Ethyl Benzene	<	0.26	0.54		3100		420		J	340		1.1	
m,p-Xylene	<	0.26	1.3		7100		730		J	400		1.4	
o-Xylene	<	0.26	<	0.24	220		390		J	320		0.52	
Styrene	<	0.26	<	0.24	<	33	13			<	32	<	0.47
cis-1,2-Dichloroethene	<	0.26	<	0.24	<	33	290		J	250		<	0.47

J= Estimated Value

NR= Not measured

R= Rejected Value (The data is unusable)

Table 13-1 cont.

Soil Gas Analytical Results - November 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-16			TT-17			TT-18			TT-19			TT-20			TT-21		
Units	ua/m ³			ua/m ³			ua/m ³			ua/m ³			ua/m ³			ua/m ³		
	Result	RL	Qual	Result	RL		Result	RL		Result	RL	Qual	Result	RL		Result	RL	
Analyte																		
Vinyl Chloride	61			20			180			18000		J	<	0.15		NR		
Bromomethane	<	1.8		<	16		<	60		<	160		<	0.3		NR		
Chloroethane	<	3.6		<	9.1		<	30		<	79		<	0.15		NR		
1,1-Dichloroethene	<	1.8		<	8.1		69			130			<	0.15		NR		
Carbon Disulfide	4.7			19			920			2800			<	0.15		NR		
Acetone	<	1.8		<	8.1		<	300		<	790		1.5			NR		
Methylene Chloride	<	1.8		<	8.1		<	30		790			0.57			NR		
trans-1,2-Dichloroethene	4.6			<	8.1		<	30		<	79		<	0.15		NR		
1,1-Dichloroethane	89			57			<	30		<	79		<	0.15		NR		
2-Butanone	<	1.8		<	8.1		<	300		<	790		<	1.5		NR		
Chloroform	<	1.8		<	8.1		<	30		<	79		<	0.15		NR		
1,1,1-Trichloroethane	<	1.8		40	8.1		<	30		<	79		<	0.15		NR		
Carbon Tetrachloride	<	1.8		<	8.1		<	30		<	79		<	0.15		NR		
Benzene	190			37	8.1		200	30		<	79		0.36	0.15		NR		
1,2-Dichloroethane	<	1.8		<	8.1		<	30		<	79		<	0.15		NR		
Trichloroethene	14			9.5	8.1		340	30		<	79		<	0.15		NR		
1,2-Dichloropropane	18			14			<	30		<	79		<	0.15		NR		
trans-1,3-Dichloropropene	<	1.8		<	8.1		<	30		<	79		<	0.15		NR		
Toluene	5.6			35			240			<	79		1.3			NR		
cis-1,3-Dichloropropene	<	1.8		<	8.1		<	30		<	79		<	0.15		NR		
Tetrachloroethene	<	1.8		NR			460			<	79		<	0.15		NR		
2-Hexanone	<	1.8		NR			<	30		<	79		<	0.15		NR		
Chlorobenzene	<	1.8		NR			51			<	79		<	0.15		NR		
Ethyl Benzene	<	1.8		NR			3200			150			0.16			NR		
m,p-Xylene	2.4		B	NR			1700			93			0.54			NR		
o-Xylene	<	1.8		NR			600			<	79		0.18			NR		
Styrene	<	1.8		NR			<	30		<	79		0.54			NR		
cis-1,2-Dichloroethene	17			<	8.1		65			560			<	0.15		NR		

J= Estimated Value

NR= Not measured

R= Rejected Value (The data is unusable)

Table 13 -1 cont.

Soil Gas Analytical Results - November 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-22			TT-23		TT-24		TT-25		TT-26			TT-26 (Duplicate)	
Units	Result	$\mu\text{g}/\text{m}^3$ RL	Qual	Result	$\mu\text{g}/\text{m}^3$ RL	Result	$\mu\text{g}/\text{m}^3$ RL	Result	$\mu\text{g}/\text{m}^3$ RL	Result	$\mu\text{g}/\text{m}^3$ RL	Qual	Result	$\mu\text{g}/\text{m}^3$ RL
Analyte														
Vinyl Chloride	0.15			<	0.12	<	0.12	<	0.12	22000		J	23000	
Bromomethane	<	0.26		<	0.24	<	0.24	<	0.23	<	150		<	850
Chloroethane	0.56			<	0.12	<	0.12	<	0.12	<	75		<	420
1,1-Dichloroethene	<	0.13		<	0.12	<	0.12	<	0.12	310			<	420
Carbon Disulfide	0.30			<	0.12	<	0.12	0.12		3000			6200	
Acetone	3.7			1.5		1.2		2.5		<	750		<	4200
Methylene Chloride	<	0.13		<	0.12	<	0.12	<	0.12	<	75		<	420
trans-1,2-Dichloroethene	0.39			<	0.12	<	0.12	<	0.12	<	75		<	420
1,1-Dichloroethane	46		J	<	0.12	<	0.12	<	0.12	440			<	420
2-Butanone	<	1.3		<	1.17	<	1.16	<	1.15	<	750		<	4200
Chloroform	1.5	0.13		0.30	0.12	0.61	0.12	<	0.12	280			<	420
1,1,1-Trichloroethane	4.9	0.13		0.28	0.12	0.22	0.12	0.25	0.12	<	75		<	420
Carbon Tetrachloride	0.13	0.13		0.12	0.12	<	0.12	<	0.12	<	75		<	420
Benzene	0.93	0.13		<	0.12	<	0.12	<	0.12	220	75		<	420
1,2-Dichloroethane	<	0.13		<	0.12	<	0.12	<	0.12	<	75		<	420
Trichloroethene	3.5	0.13		<	0.12	<	0.12	<	0.12	15000	75	J	21000	420
1,2-Dichloropropane	<	0.13		<	0.12	<	0.12	<	0.12	<	75		<	420
trans-1,3-Dichloropropene	0.18	0.13		<	0.12	<	0.12	<	0.12	<	75		<	420
Toluene	0.28			<	0.12	<	0.12	<	0.12	11000			13000	
cis-1,3-Dichloropropene	0.14			<	0.12	<	0.12	<	0.12	<	75		<	420
Tetrachloroethene	300		J	12		0.20		1.1		44000		J	80000	
2-Hexanone	<	0.13		<	0.12	<	0.12	<	0.12	<	75		<	420
Chlorobenzene	<	0.13		<	0.12	<	0.12	<	0.12	<	75		<	420
Ethyl Benzene	<	0.13		<	0.12	<	0.12	<	0.12	10000			15000	
m,p-Xylene	0.30			<	0.12	<	0.12	<	0.12	5700			8500	
o-Xylene	<	0.13		<	0.12	<	0.12	<	0.12	1400			2000	
Styrene	0.67			<	0.12	<	0.12	<	0.12	360.0			<	420
cis-1,2-Dichloroethene	<	0.13		<	0.12	<	0.12	<	0.12	1900			1700	

J= Estimated Value

NR= Not measured

R= Rejected Value (The data is unusable)

Table 13-1 cont.

Soil Gas Analytical Results - November 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-27		TT-28		TT-29		TT-30		TT-31		TT-32		
Units	ua/m ³		ua/m ³		ua/m ³		ua/m ³		ua/m ³		ua/m ³		Qual
	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	Result	RL	
Analyte													
Vinyl Chloride	<	31	<	2.4	<	0.30	<	0.31	<	0.31	18		
Bromomethane	66		<	4.7	<	0.60	<	0.62	<	0.62	<	1.9	
Chloroethane	<	31	<	2.4	<	0.30	<	0.31	<	0.31	2.7		
1,1-Dichloroethene	<	31	<	2.4	<	0.30	0.45		0.31		1.8		
Carbon Disulfide	<	31	7.1	2.4	<	1.5	<	0.95	<	1.1	9.9		
Acetone	<	310	<	23.6	<	3.0	<	3.1	<	3.1	<	9.4	
Methylene Chloride	<	31	<	2.4	<	0.30	<	0.31	<	0.3	<	0.94	
trans-1,2-Dichloroethene	<	31	<	2.4	<	0.30	0.52		0.45		4.0		
1,1-Dichloroethane	<	31	<	2.4	<	0.30	<	0.31	<	0.3	360		J
2-Butanone	<	310	<	23.6	<	2.98	<	3.1	<	3.1	<	9.4	
Chloroform	<	31	<	2.4	<	0.30	<	0.31	<	0.31	<	0.94	
1,1,1-Trichloroethane	<	31	<	2.4	7.3	0.30	<	0.31	<	0.31	<	0.94	
Carbon Tetrachloride	<	31	<	2.4	<	0.30	<	0.31	<	0.31	<	0.94	
Benzene	<	31	100		1.5		1.9		2.0		41		
1,2-Dichloroethane	<	31	<	2.4	<	0.30	<	0.31	<	0.31	1.7		R
Trichloroethene	90	31	14		<	0.30	<	0.31	<	0.31	16		
1,2-Dichloropropane	<	31	<	2.4	<	0.30	<	0.31	<	0.31	9.9		
trans-1,3-Dichloropropene	<	31	<	2.4	<	0.30	<	0.31	<	0.31	<	0.94	
Toluene	<	31	6.6		0.33		0.67		0.67		4.0		
cis-1,3-Dichloropropene	<	31	<	2.4	<	0.30	<	0.31	<	0.31	<	0.94	
Tetrachloroethene	4000		61		230		<	0.31	<	0.31	1.7		B
2-Hexanone	<	31	<	2.4	<	0.30	<	0.31	<	0.31	<	0.94	
Chlorobenzene	<	31	<	2.4	<	0.30	<	0.31	<	0.31	11		
Ethyl Benzene	<	31	52		<	0.30	0.81		0.63		1.8	0.94	
m,p-Xylene	<	31	52		0.51	0.30	1.5		1.3		4.5	0.94	
o-Xylene	<	31	31		<	0.30	0.76		0.53		4.7	0.94	
Styrene	<	31	2.6		<	0.30	<	0.31	<	0.31	<	0.94	
cis-1,2-Dichloroethene	<	31	5.7		<	0.30	0.44		0.33		8.9	0.94	

J= Estimated Value

NR= Not measured

R= Rejected Value (The data is unusable)

Table 13-1 cont.

Soil Gas Analytical Results - November 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-33		TT-34			TT-36		TT-36		TT-37			TT-38	
Units	ua/m ³		ua/m ³			ua/m ³		ua/m ³		ua/m ³			ua/m ³	
	Result	RL	Result	RL	Qual	Result	RL	Result	RL	Result	RL	Qual	Result	RL
Analyte														
Vinyl Chloride	<	3.4	220			<	0.22	<	0.22	<	0.22		<	0.23
Bromomethane	<	6.9	<	9.0		<	0.44	<	0.44	<	0.44		<	0.45
Chloroethane	3.8		5.7			<	0.22	<	0.22	<	0.22		<	0.23
1,1-Dichloroethene	<	3.4	<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
Carbon Disulfide	7.3		29			1.2		<	0.22	0.61			0.63	
Acetone	<	34.0	<	45		<	2.2	<	2.2	<	2.2		<	2.3
Methylene Chloride	<	3.4	<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
trans-1,2-Dichloroethene	6.9		21			<	0.22	<	0.22	<	0.22		<	0.23
1,1-Dichloroethane	9.2		47			<	0.22	<	0.22	<	0.22		<	0.23
2-Butanone	<	34	<	45		<	2.2	<	2.2	<	2.2		<	2.3
Chloroform	<	3.4	<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
1,1,1-Trichloroethane	<	3.4	<	4.5		<	0.22	0.32		0.83			0.68	
Carbon Tetrachloride	<	3.4	<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
Benzene	210		750			<	0.22	<	0.22	<	0.22		<	0.23
1,2-Dichloroethane	<	3.4	<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
Trichloroethene	8.7		43			<	0.22	<	0.22	<	0.22		<	0.23
1,2-Dichloropropane	<	3.4	<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
trans-1,3-Dichloropropene	<	3.4	<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
Toluene	20		190			<	0.45	<	0.23	<	0.41		<	0.35
cis-1,3-Dichloropropene	<	3.4	<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
Tetrachloroethene	<	3.4	380			0.76		2.7		130		J	14	
2-Hexanone	<	3.4	<	4.5		1.8		<	0.22	<	0.22		<	0.23
Chlorobenzene	18		<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
Ethyl Benzene	22		1000		J	<	0.22	<	0.22	<	0.22		<	0.23
m,p-Xylene	64		900			<	0.22	<	0.22	<	0.22		<	0.23
o-Xylene	4.6		340			<	0.22	<	0.22	<	0.22		<	0.23
Styrene	<	3.4	<	4.5		<	0.22	<	0.22	<	0.22		<	0.23
cis-1,2-Dichloroethene	9.2		38			<	0.22	<	0.22	<	0.22		<	0.23

J= Estimated Value

NR= Not measured

R= Rejected Value (The data is unusable)

Table 13-1 cont.

Soil Gas Analytical Results - November 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-39			TT-39 (Dup)			TT-40			TT-41		TT-42		TT-43	
Units	Result	ua/m ³ RL	Qual	Result	ua/m ³ RL	Qual	Result	ua/m ³ RL	Qual	Result	ua/m ³ RL	Result	ua/m ³ RL	Result	ua/m ³ RL
Analyte															
Vinyl Chloride	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
Bromomethane	<	0.44		<	0.44		<	0.45		<	0.41	0.61		<	0.44
Chloroethane	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
1,1-Dichloroethene	<	0.22		<	0.22		0.50			<	0.2	<	0.22	<	0.22
Carbon Disulfide	0.45			0.26			0.72			1.3		0.23		0.61	
Acetone	<	2.2		<	2.2		<	2.3		<	2.0	<	2.2	<	2.2
Methylene Chloride	<	0.22		<	0.22		1.4			<	0.2	<	0.22	<	0.22
trans-1,2-Dichloroethene	<	0.22		<	0.22		2.5			<	0.2	<	0.22	<	0.22
1,1-Dichloroethane	<	0.22		<	0.22		4.2			<	0.2	<	0.22	<	0.22
2-Butanone	<	2.2		<	2.2		<	2.3		<	2.0	<	2.2	<	2.2
Chloroform	<	0.22		<	0.22		2.9			<	0.2	1.6		<	0.22
1,1,1-Trichloroethane	0.76			0.67			9.1			0.26		0.25		0.22	
Carbon Tetrachloride	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
Benzene	<	0.22		<	0.22		1.1			<	0.2	<	0.22	<	0.22
1,2-Dichloroethane	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
Trichloroethene	<	0.22		<	0.22		77		J	<	0.2	<	0.22	<	0.22
1,2-Dichloropropane	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
trans-1,3-Dichloropropene	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
Toluene	2.4			0.71			2.5			0.36		0.87		0.70	
cis-1,3-Dichloropropene	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
Tetrachloroethene	110		J	89		J	1100		J	<	0.2	1.0		10	
2-Hexanone	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
Chlorobenzene	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
Ethyl Benzene	<	0.22		<	0.22		0.63			<	0.2	<	0.22	<	0.22
m,p-Xylene	<	0.22		<	0.22		0.91			<	0.2	<	0.22	<	0.22
o-Xylene	<	0.22		<	0.22		0.38			<	0.2	<	0.22	<	0.22
Styrene	<	0.22		<	0.22		<	0.23		<	0.2	<	0.22	<	0.22
cis-1,2-Dichloroethene	<	0.22		<	0.22		7.7			<	0.2	<	0.22	<	0.22

J= Estimated Value

NR= Not measured

R= Rejected Value (The data is unusable)

Table 13 -1 cont.

Soil Gas Analytical Results - November 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-44		TT-45			TT-46		TT-46 (Duplicate)		TT-47			TT-48	
Units	Result	RL	Result	RL	Qual	Result	RL	Result	RL	Result	RL	Qual	Result	RL
Analyte														
Vinyl Chloride	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
Bromomethane	<	0.45	<	0.43		<	0.45	<	0.45	0.63			<	0.43
Chloroethane	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
1,1-Dichloroethene	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
Carbon Disulfide	0.28		0.57			1.4		0.63		1.2			1.1	
Acetone	<	2.3	<	2.2		2.3		<	2.2	<	2.3		<	2.2
Methylene Chloride	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
trans-1,2-Dichloroethene	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
1,1-Dichloroethane	<	0.23	2.6			1.5		0.94		6.8			4.7	
2-Butanone	<	2.3	<	2.2		<	2.25	<	2.2	<	2.3		<	2.2
Chloroform	<	0.23	1.0			1.7		1.0		2.4			0.22	
1,1,1-Trichloroethane	<	0.23	100		J	5.9		3.4		68		J	6.0	
Carbon Tetrachloride	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
Benzene	<	0.23	<	0.22		0.27		<	0.22	<	0.23		0.99	
1,2-Dichloroethane	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
Trichloroethene	<	0.23	1.6			0.28		<	0.22	<	0.23		2.8	
1,2-Dichloropropane	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
trans-1,3-Dichloropropene	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
Toluene	0.73		0.42			3.6		0.80		1.2			6.9	
cis-1,3-Dichloropropene	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
Tetrachloroethene	1.4		1.2			7.2		5.4		2.0			4.7	
2-Hexanone	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
Chlorobenzene	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
Ethyl Benzene	<	0.23	<	0.22		0.30		<	0.22	<	0.23		0.37	
m,p-Xylene	<	0.23	<	0.22		0.54		<	0.22	<	0.23		<	0.22
o-Xylene	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
Styrene	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22
cis-1,2-Dichloroethene	<	0.23	<	0.22		<	0.22	<	0.22	<	0.23		<	0.22

J= Estimated Value

NR= Not measured

R= Rejected Value (The data is unusable)

Table 13-1 cont.

Soil Gas Analytical Results - November 1998
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-49			TT-50		TT-51		TT-52		TT-53	
Units	Result	$\mu\text{a}/\text{m}^3$ RL	Qual	Result	$\mu\text{a}/\text{m}^3$ RL	Result	$\mu\text{a}/\text{m}^3$ RL	Result	$\mu\text{a}/\text{m}^3$ RL	Result	$\mu\text{a}/\text{m}^3$ RL
Analyte											
Vinyl Chloride	<	0.21		<	0.21	<	0.23	<	0.23	<	0.22
Bromomethane	0.81			<	0.43	<	0.45	<	0.45	<	0.45
Chloroethane	4.3			<	0.21	<	0.23	<	0.45	<	0.22
1,1-Dichloroethene	0.56			<	0.21	<	0.23	<	0.23	<	0.22
Carbon Disulfide	1.2			0.25		0.44		0.50		<	0.22
Acetone	<	2.1		<	2.1	<	2.3	<	2.3	<	2.2
Methylene Chloride	<	0.21		<	0.21	<	0.23	<	0.23	<	0.22
trans-1,2-Dichloroethene	0.51			<	0.21	<	0.23	<	0.23	<	0.22
1,1-Dichloroethane	280		J	0.32		9.0		<	0.23	<	0.22
2-Butanone	<	2.1		<	2.1	<	2.3	<	2.3	<	2.2
Chloroform	<	0.21		<	0.21	<	0.23	<	0.23	<	0.22
1,1,1-Trichloroethane	7.3			0.27		0.37		<	0.23	<	0.22
Carbon Tetrachloride	<	0.21		<	0.21	<	0.23	<	0.23	<	0.22
Benzene	6.0			0.22		0.45		<	0.23	<	0.22
1,2-Dichloroethane	0.38			<	0.21	<	0.23	<	0.23	<	0.22
Trichloroethene	40			1.0		<	0.23	<	0.23	<	0.22
1,2-Dichloropropane	4.7			<	0.21	<	0.23	<	0.23	<	0.22
trans-1,3-Dichloropropene	<	0.21		<	0.21	<	0.23	<	0.23	<	0.22
Toluene	1.2			0.40		0.45		<	0.23	<	0.22
cis-1,3-Dichloropropene	<	0.21		<	0.21	<	0.23	<	0.23	<	0.22
Tetrachloroethene	39			2.1		1.8		<	0.23	<	0.22
2-Hexanone	<	0.21		<	0.21	<	0.23	<	0.23	<	0.22
Chlorobenzene	<	0.21		<	0.21	<	0.23	<	0.23	<	0.22
Ethyl Benzene	6.0			<	0.21	<	0.23	<	0.23	<	0.22
m,p-Xylene	9.4			<	0.21	<	0.23	<	0.23	<	0.22
o-Xylene	3.6			<	0.21	<	0.23	<	0.23	<	0.22
Styrene	<	0.21		<	0.21	<	0.23	<	0.23	<	0.22
cis-1,2-Dichloroethene	2.8			<	0.21	<	0.23	<	0.23	<	0.22

J= Estimated Value

NR= Not measured

R= Rejected Value (The data is unusable)

Table 13-2

Soil Gas Analytical Results - October 1999
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location Sample Tube Numbers Compound - Units	TT-54 11009A			TT-61/TT-54 11021A&11009B			TT-55 11014A&B			TT-56 11003A&B			TT-56 Duplicate 11005A&B			TT-57 11108A&B		
	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual
Chloromethane	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		<	0.46	
Vinyl Chloride	-	0.48		-	0.47		-	0.44		20000	0.81		16000	0.89		<	0.46	
Bromomethane	-	0.48		-	0.47		-	0.44		11	0.81		<	0.89		<	0.46	
Chloroethane	-	0.48		-	0.47		-	0.44		530	0.81		<	0.89		-	0.46	
Trion 11	-	0.48		3.8	0.47	J	0.85	0.44		370	0.81		-	0.89		1.1	0.46	
1,1-Dichloroethene	-	0.48		-	0.47		-	0.44		1900	0.81		<	0.89		-	0.46	
Carbon Disulfide	1.1	0.48	J	0.71	0.47	J	0.71	0.44		19000	0.81		9800	0.89		-	0.46	
Acetone	-	2.4		3.3	2.4	J	-	2.2		<	4.1		<	4.5		4.6	2.3	
Methylene Chloride	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		-	0.46	
trans-1,2-Dichloroethene	-	0.48		-	0.47		-	0.44		-	0.81		<	0.89		<	0.46	
1,1-Dichloroethane	-	0.48		-	0.47		-	0.44		1500	0.81		-	0.89		-	0.46	
Vinyl Acetate	-	0.48		-	0.5		-	0.44		<	0.81		<	0.89		-	0.46	
2-Butanone	-	2.4		-	2.4		-	0.44		<	4.1		<	4.5		2.7	2.3	
Chloroform	-	0.48		-	0.47		-	0.44		110	0.81		<	0.89		-	0.46	
1,1,1-Trichloroethane	-	0.48		0.57	0.47	J	-	0.44		-	0.81		<	0.89		-	0.46	
Carbon Tetrachloride	-	0.48		-	0.47		-	0.44		-	0.81		<	0.89		-	0.46	
Benzene	-	0.48		-	0.47		-	0.44		380	0.81		<	0.89		-	0.46	
1,2-Dichloroethane	-	0.48		-	0.47		-	0.44		<	0.81		-	0.89		-	0.46	
Trichloroethene	-	0.48		-	0.47		-	0.44		6600	0.81		14000	0.89		<	0.46	
1,2-Dichloropropane	-	0.48		-	0.47		-	0.44		-	0.81		<	0.89		-	0.46	
Bromodichloromethane	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		-	0.46	
trans-1,3-Dichloropropene	-	0.48		-	0.47		-	0.44		-	0.81		<	0.89		-	0.46	
4-Methyl-2-pentanone	-	2.4		-	2.4		-	2.2		-	4.1		<	4.5		-	2.3	
Toluene	0.58	0.48	J	0.57	0.47	J	-	0.44		2800	0.81		6800	0.89		-	0.46	
cis-1,3-Dichloropropene	-	0.48		-	0.47		-	0.44		-	0.81		<	0.89		-	0.46	
1,1,2-Trichloroethane	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		-	0.46	
Tetrachloroethene	-	0.48		76	0.47	JF	-	0.44		6000	0.81		14884	0.89		<	0.46	
2-Hexanone	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		-	0.46	
Dibromochloromethane	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		-	0.46	
Chlorobenzene	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		-	0.46	
Ethyl Benzene	-	0.48		-	0.47		-	0.44		1400	0.81		6400	0.89		-	0.46	
m,p-Xylene	-	0.48		-	0.47		-	0.44		900	0.81		4500	0.89		-	0.46	
o-Xylene	-	0.48		-	0.47		-	0.44		270	0.81		980	0.89		-	0.46	
Styrene	-	0.48		-	0.47		-	0.44		90	0.81		<	0.89		-	0.46	
Bromoform	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		-	0.46	
1,1,2,2-Tetrachloroethane	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		-	0.46	
1,3-Dichlorobenzene	-	0.48		-	0.47		-	0.44		<	0.81		<	0.89		-	0.46	
1,4-Dichlorobenzene	-	0.48		-	0.47		-	0.44		50	0.81		<	0.89		-	0.46	
1,2-Dichlorobenzene	-	0.48		-	0.47		-	0.44		3.4	0.81		<	0.89		-	0.46	
cis-1,2-Dichloroethene	-	0.48		-	0.47		-	0.44		4200	0.81		2200	0.89		<	0.46	

J - Exceeds instrument calibration

S - Peak Saturation

RL - Reporting Limit

NS - Not Sampled

NR - Not Reported

NA - Not Applicable

- - Not detected

Table 13-2 cont.

Soil Gas Analytical Results - October 1999
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location Sample Tube Numbers Compound - Units	TT-58 11019A&B			TT-59 11105A&B			TT-60 11022A&B			TT-61 11021B			TT-62 11107 A&B			TT-63 11104A&B		
	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual
Chloromethane	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
Vinyl Chloride	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
Bromomethane	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
Chloroethane	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
Freon 11	3.1	0.47		0.76	0.47		0.78	0.46		1.1	0.47	J	90	0.47		190	0.47	
1,1-Dichloroethene	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
Carbon Disulfide	0.66	0.47		4.7	0.47		0.76	0.46		<	0.47		1.2	0.47		0.84	0.47	
Acetone	2.9	2.4		4.4	2.4		4.3	2.3		<	2.3		7.1	2.4		-	2.3	
Methylene Chloride	-	0.47		-	0.47		0.59	0.46		<	0.47		4.7	0.47		-	0.47	
trans-1,2-Dichloroethene	-	0.47		-	0.47		-	0.46		<	0.47		7.1	0.47		-	0.47	
1,1-Dichloroethane	-	0.47		-	0.47		-	0.46		<	0.47		5.7	0.47		3.4	0.47	
Vinyl Acetate	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
2-Butanone	-	2.4		2.8	2.4		2.5	2.3		<	2.3		6.1	2.4		-	2.3	
Chloroform	-	0.47		-	0.47		-	0.46		<	0.47		3.1	0.47		1.4	0.47	
1,1,1-Trichloroethane	-	0.47		-	0.47		-	0.46		<	0.47		12	0.47		2.2	0.47	
Carbon Tetrachloride	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
Benzene	-	0.47		0.62	0.47		-	0.46		<	0.47		1.8	0.47		-	0.47	
1,2-Dichloroethane	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
Trichloroethene	-	0.47		-	0.47		-	0.46		<	0.47		40	0.47		0.75	0.47	
1,2-Dichloropropane	-	0.47		-	0.47		-	0.46		<	0.47		1.2	0.47		-	0.47	
Bromodichloromethane	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
trans-1,3-Dichloropropene	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
4-Methyl-2-pentanone	-	2.4		-	2.4		-	2.3		<	2.3		3.1	2.4		-	2.3	
Toluene	-	0.47		0.85	0.47		-	0.46		<	0.47		20	0.47		5.1	0.47	
cis-1,3-Dichloropropene	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
1,1,2-Trichloroethane	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
Tetrachloroethene	-	0.47		-	0.47		0.80	0.46		1.6	0.47	J	990	0.47		120	0.47	
2-Hexanone	-	0.47		-	0.47		-	0.46		<	0.47		-	0.47		-	0.47	
Dibromochloromethane	-	0.47		-	0.47		-	0.46		<	0.47		-	0.47		-	0.47	
Chlorobenzene	-	0.47		-	0.47		-	0.46		<	0.47		-	0.47		-	0.47	
Ethyl Benzene	-	0.47		0.52	0.47		-	0.46		<	0.47		14	0.47		-	0.47	
m,p-Xylene	-	0.47		-	0.47		-	0.46		<	0.47		3.9	0.47		-	0.47	
o-Xylene	-	0.47		-	0.47		-	0.46		<	0.47		1.3	0.47		-	0.47	
Styrene	-	0.47		0.57	0.47		-	0.46		<	0.47		5.7	0.47		-	0.47	
Bromoform	-	0.47		<	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
1,1,1,2,2-Tetrachloroethane	-	0.47		<	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
1,3-Dichlorobenzene	-	0.47		-	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
1,4-Dichlorobenzene	-	0.47		<	0.47		-	0.46		<	0.47		2.7	0.47		-	0.47	
1,2-Dichlorobenzene	-	0.47		<	0.47		-	0.46		<	0.47		<	0.47		-	0.47	
cis-1,2-Dichloroethene	-	0.47		<	0.47		-	0.46		<	0.47		24	0.47		-	0.47	

E: Exceeds instrument calibration

S: Peak Saturation

RL: Reporting Limit

NS: Not Sampled

NR: Not Reported

NA: Not Applicable

- : Not detected

Table 13-2 cont.

Soil Gas Analytical Results - October 1999
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location Sample Tube Numbers Compound - Units	TT-64 11015A&B			TT-65 11002A&B			TT-66 11024A&B			TT-67 11017A&B			TT-68 11110A&B			TT-69 11214A&B		
	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual
Chloromethane	-	0.50		-	0.49		-	0.49		-	0.48		3.0	0.48		-	0.45	
Vinyl Chloride	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Bromomethane	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Chloroethane	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Propan-1	110	0.50		0.59	0.49		0.68	0.49		1.3	0.48		1.1	0.48		0.77	0.45	
1,1-Dichloroethene	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Carbon Disulfide	1.7	0.50		1.4	0.49		-	0.49		-	0.48		0.53	0.48		0.45	0.45	
Acetone	9.0	2.5		-	2.4		-	2.4		4.5	2.4		6.2	2.4		-	2.3	
Methylene Chloride	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
trans-1,2-Dichloroethene	-	0.50		-	0.49		-	0.49		-	0.48		-	0.48		-	0.45	
1,1-Dichloroethane	22	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Vinyl Acetate	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Butanone	3.0	2.5		-	2.4		1.7	2.4		2.7	2.4		3.0	2.4		-	2.3	
Chloroform	7.8	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
1,1,1-Trichloroethane	0.68	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Carbon Tetrachloride	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Benzene	0.50	0.50		0.64	0.49		-	0.49		-	0.48		1.06	0.48		-	0.45	
1,2-Dichloroethane	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Trichloroethene	29	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
1,2-Dichloropropane	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Bromodichloromethane	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
trans-1,3-Dichloropropene	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
1-Methyl-2-pentanone	-	2.5		-	2.4		-	2.4		-	2.4		-	2.4		-	2.3	
Toluene	6.5	0.50		4.9	0.49		-	0.49		-	0.48		0.86	0.48		-	0.45	
cis-1,3-Dichloropropene	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
1,1,2-Trichloroethane	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Tetrachloroethene	140	0.50		-	0.49		-	0.49		0.57	0.48		0.48	0.48		0.45	0.45	
3-Hexanone	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Dibromochloromethane	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Chlorobenzene	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
1,1,1-Trichlorobenzene	1.4	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
m,p-Xylene	1.6	0.50		1.7	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
o-Xylene	1.1	0.50		0.54	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Styrene	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
Bromotoluene	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
1,1,2,2-Tetrachloroethane	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
1,3-Dichlorobenzene	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
1,4-Dichlorobenzene	16	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
1,2-Dichlorobenzene	-	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	
cis-1,2-Dichloroethene	0.75	0.50		-	0.49		-	0.49		-	0.48		<	0.48		-	0.45	

E - Exceeds instrument calibration

S - Peak Saturation

RL - Reporting Limit

NS - Not Sampled

NR - Not Reported

NA - Not Applicable

- Not detected

Table 13-2 cont.

Soil Gas Analytical Results - October 1999
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location Sample Tube Numbers Compound - Units	TT-70 11006A&B			TT-71 11023A&B			TT-72 11013A&B			TT-73 11008A&B			TT-74 11106A&B			TT-75 11218A&B		
	$\mu\text{g}/\text{m}^3$	RL	Qual	$\mu\text{g}/\text{m}^3$	RL	Qual	$\mu\text{g}/\text{m}^3$	RL	Qual	$\mu\text{g}/\text{m}^3$	RL	Qual	$\mu\text{g}/\text{m}^3$	RL	Qual	$\mu\text{g}/\text{m}^3$	RL	Qual
Chloromethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Vinyl Chloride	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Bromomethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Chloroethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Freon 11	0.62	0.51		0.85	0.47		0.86	0.48		0.61	0.47		0.68	0.48		0.71	0.44	
1,1-Dichloroethene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Carbon Disulfide	0.82	0.51		1.1	0.47		1.2	0.48		<	0.47		<	0.48		0.49	0.44	
Acetone	3.0	2.6		4.7	2.3		<	2.4		<	2.3		<	2.4		5.3	2.2	
Methylene Chloride	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
trans-1,2-Dichloroethene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
1,1-Dichloroethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Vinyl Acetate	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
2-Butanone	<	2.6		<	2.3		<	2.4		<	2.3		<	2.4		<	2.2	
Chloroform	<	0.51		<	0.47		<	0.48		0.66	0.47		<	0.48		1.4	0.44	
1,1,1-Trichloroethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		0.80	0.44	
Carbon Tetrachloride	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Benzene	<	0.51		0.47	0.47		<	0.48		2.2	0.47		<	0.48		<	0.44	
1,2-Dichloroethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Trichloroethene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
1,2-Dichloropropane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Bromodichloromethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
trans-1,3-Dichloropropene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
4-Methyl-2-pentanone	<	2.6		<	2.3		<	2.4		<	2.3		<	2.4		<	2.2	
Toluene	<	0.51		0.89	0.47		0.77	0.48		4.6	0.47		<	0.48		<	0.44	
cis-1,3-Dichloropropene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
1,1,2-Trichloroethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Tetrachloroethene	<	0.51		32	0.47		25	0.48		<	0.47		<	0.48		<	0.44	
2-Hexanone	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Dibromochloromethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Chlorobenzene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Ethyl Benzene	<	0.51		0.66	0.47		<	0.48		1.5	0.47		<	0.48		<	0.44	
m,p-Xylene	0.62	0.51		<	0.47		<	0.48		2.3	0.47		<	0.48		<	0.44	
o-Xylene	<	0.51		<	0.47		<	0.48		0.85	0.47		<	0.48		<	0.44	
Styrene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
Bromoform	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
1,1,2,2-Tetrachloroethane	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
1,3-Dichlorobenzene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
1,4-Dichlorobenzene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
1,2-Dichlorobenzene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	
cis-1,2-Dichloroethene	<	0.51		<	0.47		<	0.48		<	0.47		<	0.48		<	0.44	

F: Exceeds instrument calibration

S: Peak Saturation

RL: Reporting Limit

NS: Not Sampled

NR: Not Reported

NA: Not Applicable

Not detected

Table 13-2 cont.

Soil Gas Analytical Results - October 1999
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location Sample Tube Numbers Compound - Units	TT-76 11206A&B			TT-77 11211A&B			TT-78 11225A&B			TT-79 11210A&B			TT-80 11223A&B			TT-81 11201A&B		
	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual
Chloromethane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Vinyl Chloride	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Bromomethane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Chloroethane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Freon 11	0.90	0.45		1.6	0.48		1.4	0.49		5.6	0.47		1.7	0.48		0.75	0.47	
1,1-Dichloroethene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Carbon Disulfide	0.99	0.45		0.86	0.48		1.6	0.49		-	0.47		0.53	0.48		1.2	0.47	
Acetone	-	2.4		-	2.4		1.0	2.5		-	2.3		-	2.4		-	2.4	
Methylene Chloride	-	0.45		-	0.48		0.64	0.49		-	0.47		0.53	0.48		0.47	0.47	
trans-1,2-Dichloroethene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
1,1-Dichloroethane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Vinyl Acetate	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
2-Butanone	-	2.4		-	2.4		-	2.5		-	2.3		-	2.4		-	2.4	
Chloroform	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
1,1,1-Trichloroethane	-	0.45		-	0.48		-	0.49		0.51	0.47		-	0.48		-	0.47	
Carbon Tetrachloride	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Benzene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
1,2-Dichloroethane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Trichloroethene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
1,2-Dichloropropane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Bromodichloromethane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
trans-1,3-Dichloropropene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
4-Methyl-2-pentanone	-	2.4		-	2.4		-	2.5		-	2.3		-	2.4		-	2.4	
Toluene	-	0.45		-	0.48		8.8	0.49		-	0.47		-	0.48		-	0.47	
cis-1,3-Dichloropropene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
1,1,2-Trichloroethane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Tetrachloroethene	-	0.45		5.7	0.48		3.0	0.49		19	0.47		1.2	0.48		0.52	0.47	
2-Hexanone	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Dibromochloromethane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Chlorobenzene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Ethyl Benzene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
m,p-Xylene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
o-Xylene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Styrene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
Bromoform	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
1,1,2,2-Tetrachloroethane	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
1,3-Dichlorobenzene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
1,4-Dichlorobenzene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
1,2-Dichlorobenzene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	
cis-1,2-Dichloroethene	-	0.45		-	0.48		-	0.49		-	0.47		-	0.48		-	0.47	

I- Exceeds instrument calibration

S- Peak Saturation

RL- Reporting Limit

NS- Not Sampled

NR- Not Reported

NA- Not Applicable

- Not detected

Table 13-2 cont.

Soil Gas Analytical Results - October 1999
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-82			TT-83			TT-84			TT-85		TT-86			TT-87		
Sample Tube Numbers	11004A&B			11111A&B			11102A&B					11215A&B			11224A&B		
Compound - Units	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	µg/m ³	RL	Qual	µg/m ³	RL	Qual
Chloromethane	-	0.48		-	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
Vinyl Chloride	-	0.48		-	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
Bromomethane	-	0.48		-	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
Chloroethane	-	0.48		-	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
Freon 11	0.72	0.48		0.51	0.47		0.65	0.46		NR	NA	3.3	0.46		1.2	0.47	
1,1-Dichloroethene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
Carbon Disulfide	2.2	0.48		2.7	0.47		1.8	0.46		NR	NA	3.7	0.46		0.94	0.47	
Acetone	-	2.4		-	2.3		-	2.3		NR	NA	4.3	2.3		-	2.4	
Methylene Chloride	0.53	0.48		0.51	0.47		1.8	0.46		NR	NA	-	0.46		-	0.47	
trans-1,2-Dichloroethene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
1,1-Dichloroethane	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
Vinyl Acetate	-	0.48		-	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
2-Butanone	-	2.4		-	2.3		-	2.3		NR	NA	<	2.3		-	2.4	
Chloroform	-	0.48		<	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
1,1,1-Trichloroethane	-	0.48		-	0.47		-	0.46		NR	NA	2.4	0.46		-	0.47	
Carbon Tetrachloride	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
Benzene	-	0.48		-	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
1,2-Dichloroethane	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
1-chloroethene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
1,2-Dichloropropane	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
Bromodichloromethane	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
trans-1,3-Dichloropropene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
4-Methyl-2-pentanone	-	2.4		-	2.3		-	2.3		NR	NA	-	2.3		-	2.4	
Toluene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
cis-1,3-Dichloropropene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
1,1,2-Trichloroethane	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
Tetrachloroethene	-	0.48		-	0.47		-	0.46		NR	NA	0.69	0.46		0.61	0.47	
2-Hexanone	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
Dibromochloromethane	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
Chlorobenzene	-	0.48		-	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
1,3,5-Triphenyl Benzene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
m,p-Xylene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
o-Xylene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
Styrene	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
Bromoform	-	0.48		-	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
1,1,2,2-Tetrachloroethane	<	0.48		<	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
1,3-Dichlorobenzene	<	0.48		<	0.47		-	0.46		NR	NA	-	0.46		-	0.47	
1,4-Dichlorobenzene	-	0.48		<	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
1,2-Dichlorobenzene	-	0.48		<	0.47		-	0.46		NR	NA	<	0.46		-	0.47	
cis-1,2-Dichloroethene	-	0.48		<	0.47		-	0.46		NR	NA	<	0.46		-	0.47	

E: Exceeds instrument calibration

S: Peak Saturation

RL: Reporting Limit

NS: Not Sampled

NR: Not Reported

NA: Not Applicable

- : Not detected

Table 13-2 cont.

Soil Gas Analytical Results - October 1999
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location Sample Tube Numbers Compound - Units	TT-88 NS		TT-89 11313A&B			TT-90 11222A&B			TT-91 11315A&B			TT-92 11207A&B			TT-93 NS		TT-94 NS	
	µg/m ³	RL	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	µg/m ³	RL
Chloroform	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Vinyl Chloride	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Bromomethane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Chloroethane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Tricloroethylene	NS	NA	1.5	0.46		1.7	0.50		1.0	0.47		2.1	0.47		NS	NA	NS	NA
1,1-Dichloroethene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Carbon Disulfide	NS	NA	-	0.46		1.9	0.50		-	0.47		1.4	0.47		NS	NA	NS	NA
Acetone	NS	NA	-	2.3		2.8	2.5		-	2.4		-	2.4		NS	NA	NS	NA
Methylene Chloride	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
trans-1,2-Dichloroethene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
1,1-Dichloroethane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Vinyl Acetate	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
2-Butanone	NS	NA	-	2.3		-	2.5		-	2.4		-	2.4		NS	NA	NS	NA
Chloroform	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
1,1,1-Trichloroethane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Carbon Tetrachloride	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Benzene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
1,2-Dichloroethane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Trichloroethene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
1,2-Dichloropropane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Bromodichloromethane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
trans-1,3-Dichloropropene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
4-Methyl-2-pentanone	NS	NA	-	2.3		-	2.5		-	2.4		-	2.4		NS	NA	NS	NA
Toluene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
cis-1,3-Dichloropropene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
1,1,2-Trichloroethane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Tetrachloroethene	NS	NA	-	0.46		0.65	0.50		0.90	0.47		-	0.47		NS	NA	NS	NA
2-Hexanone	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Dibromochloromethane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Chlorobenzene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Ethyl Benzene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
m,p-Xylene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
o-Xylene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Styrene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
Bromoforn	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
1,1,2,2-Tetrachloroethane	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
1,3-Dichlorobenzene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
1,4-Dichlorobenzene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
1,2-Dichlorobenzene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA
cis-1,2-Dichloroethene	NS	NA	-	0.46		-	0.50		-	0.47		-	0.47		NS	NA	NS	NA

F: Exceeds instrument calibration

S: Peak Saturation

RL: Reporting Limit

NS: Not Sampled

NR: Not Reported

NA: Not Applicable

- : Not Detected

Table 13-2 cont.

Soil Gas Analytical Results - October 1999
Himco Dump Superfund Site
Elkhart, Indiana

Sample Location	TT-95			TT-95 Duplicate			TT-96			TT-97			TT-97 Duplicate			TT-98		
Sample Tube Numbers	11317A&B			11304A&B			11217A&B			11310A&B			11205A&B			11203A&B		
Compound - Units	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual
Chloromethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Vinyl Chloride	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Bromomethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Chloroethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Ethanol	0.70	0.46		0.61	0.44		1.5	0.48		1.3	0.48		2.0	0.49		0.99	0.50	
1,1-Dichloroethene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Carbon Disulfide	<	0.46		1.4	0.44		1.1	0.48		4.4	0.48		2.7	0.49		3.3	0.50	
Acetone	<	2.2		<	2.3		2.7	2.4		<	2.4		3.2	2.5		<	2.5	
Methylene Chloride	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
trans-1,2-Dichloroethene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
1,1-Dichloroethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Vinyl Acetate	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
2-Butanone	<	2.2		<	2.3		<	2.4		<	2.4		<	2.5		<	2.5	
Chloroform	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
1,1,1-Trichloroethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Carbon Tetrachloride	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Benzene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
1,2-Dichloroethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Trichloroethene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
1,2-Dichloropropane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Bromodichloromethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
trans-1,3-Dichloropropene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
4-Methyl-2-pentanone	<	2.2		<	2.3		<	2.4		<	2.4		<	2.5		<	2.5	
Toluene	0.83	0.46		0.48	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
cis-1,3-Dichloropropene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
1,1,2-Trichloroethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Tetrachloroethene	1.3	0.46		1.6	0.44		<	0.48		0.82	0.48		0.69	0.49		<	0.50	
2-Hexanone	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Dibromochloromethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Chlorobenzene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Ethyl Benzene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
m,p-Xylene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
o-Xylene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Styrene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
Bromoform	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
1,1,2,2-Tetrachloroethane	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
1,3-Dichlorobenzene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
1,4-Dichlorobenzene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
1,2-Dichlorobenzene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	
cis-1,2-Dichloroethene	<	0.46		<	0.44		<	0.48		<	0.48		<	0.49		<	0.50	

E: Exceeds instrument calibration

S: Peak Saturation

RL: Reporting Limit

NS: Not Sampled

NR: Not Reported

NA: Not Applicable

<: Not detected

Table 13-2 cont.

Soil Gas Analytical Results - October 1999
Hinco Dump Superfund Site
Elkhart, Indiana

Sample Location Sample Tube Numbers Compound - Units	TT-99		TT-100			TT-101			TT-102		
	NS		11311A&B			11212A&B			11216A&B		
	µg/m ³	RL	µg/m ³	RL	Qual	µg/m ³	RL	Qual	µg/m ³	RL	Qual
Chloromethane	NS	NA	-	0.48		<	0.49		<	0.46	
Vinyl Chloride	-		-	0.48		-	0.49		-	0.46	
Bromomethane	-		-	0.48		-	0.49		-	0.46	
Chloroethane	-		-	0.48		-	0.49		-	0.46	
Isobutylene	-		0.72	0.48		0.98	0.49		1.1	0.46	
1,1-Dichloroethene	-		-	0.48		-	0.49		-	0.46	
Carbon Disulfide	-		-	0.48		1.1	0.49		0.87	0.46	
Acetone	-		-	2.4		6.8	2.4		-	2.3	
Methylene Chloride	-		-	0.48		-	0.49		-	0.46	
trans-1,2-Dichloroethene	-		-	0.48		-	0.49		-	0.46	
1,1-Dichloroethane	-		-	0.48		-	0.49		-	0.46	
Vinyl Acetate	-		-	0.48		-	0.49		-	0.46	
2-Butanone	-		-	2.4		-	2.4		-	2.3	
Chloroform	-		-	0.48		-	0.49		-	0.46	
1,1,1-Trichloroethane	-		-	0.48		-	0.49		0.82	0.46	
Carbon Tetrachloride	-		-	0.48		-	0.49		-	0.46	
Benzene	-		-	0.48		-	0.49		-	0.46	
1,2-Dichloroethane	-		-	0.48		-	0.49		-	0.46	
Trichloroethene	-		-	0.48		-	0.49		-	0.46	
1,2-Dichloropropane	-		-	0.48		-	0.49		-	0.46	
Bromodichloromethane	-		-	0.48		-	0.49		-	0.46	
trans-1,3-Dichloropropene	-		-	0.48		-	0.49		-	0.46	
4-Methyl-2-pentanone	-		-	2.4		-	2.4		-	2.3	
Toluene	-		-	0.48		-	0.49		-	0.46	
cis-1,3-Dichloropropene	-		-	0.48		-	0.49		-	0.46	
1,1,2-Trichloroethane	-		-	0.48		-	0.49		-	0.46	
Tetrachloroethene	-		-	0.48		-	0.49		-	0.46	
2-Hexanone	-		-	0.48		-	0.49		-	0.46	
Dibromochloromethane	-		-	0.48		-	0.49		-	0.46	
Chlorobenzene	-		-	0.48		-	0.49		-	0.46	
Ethyl Benzene	-		-	0.48		-	0.49		-	0.46	
m,p-Xylene	-		-	0.48		-	0.49		-	0.46	
o-Xylene	-		-	0.48		-	0.49		-	0.46	
Styrene	-		-	0.48		-	0.49		-	0.46	
Bromoform	-		-	0.48		-	0.49		-	0.46	
1,1,2,2-Tetrachloroethane	-		-	0.48		-	0.49		-	0.46	
1,3-Dichlorobenzene	-		-	0.48		-	0.49		-	0.46	
1,4-Dichlorobenzene	-		-	0.48		-	0.49		-	0.46	
1,2-Dichlorobenzene	-		-	0.48		-	0.49		-	0.46	
cis-1,2-Dichloroethene	-		-	0.48		-	0.49		-	0.46	

L - Exceeds instrument calibration
 S - Peak Saturation
 RL - Reporting Limit
 NS - Not Sampled
 NR - Not Reported
 NA - Not Applicable
 - - Not detected

Table 14

HIMCO DUMP MUNICIPAL WATER SUPPLY CONNECTION LIST

1.	54093 Westwood Drive	21.	54305 Westwood Drive
2.	27876 Westwood Drive	22.	27964 Westwood Drive
3.	54111 Westwood Drive	23.	27948 Westwood Drive
4.	54106 Westwood Drive	24.	27928 Westwood Drive
5.	54125 Westwood Drive	25.	27908 Westwood Drive
6.	54124 Westwood Drive	26.	54248 Westwood Drive
7.	54145 Westwood Drive	27.	54260 Westwood Drive
8.	54146 Westwood Drive	28.	54280 Westwood Drive
9.	54161 Westwood Drive	29.	27947 Westwood Drive
10.	54162 Westwood Drive	30.	27883 Westwood Drive
11.	54179 Westwood Drive	31.	27853 Westwood Drive
12.	54180 Westwood Drive	32.	27919 Westwood Drive
13.	54197 Westwood Drive	33.	54271 Northwood Drive
14.	54198 Westwood Drive	34.	54253 Northwood Drive
15.	54215 Westwood Drive	35.	54239 Northwood Drive
16.	54212 Westwood Drive	36.	54240 Northwood Drive
17.	54231 Westwood Drive	37.	54250 Northwood Drive
18.	54253 Westwood Drive	38.	54274 Northwood Drive
19.	54271 Westwood Drive	39.	54290 Northwood Drive
20.	54287 Westwood Drive		

Table 15

HIMCO DUMP WELL ABANDONMENT LIST

1.	54093 Westwood Drive	24.	27928 Westwood Drive
2.	27876 Westwood Drive	25.	27908 Westwood Drive
3.	54111 Westwood Drive	26.	54248 Westwood Drive
4.	54106 Westwood Drive	27.	54260 Westwood Drive
5.	54125 Westwood Drive	28.	54280 Westwood Drive
6.	54124 Westwood Drive	29.	27947 Westwood Drive
7.	54145 Westwood Drive	30.	27883 Westwood Drive
8.	54146 Westwood Drive	31.	27853 Westwood Drive
9.	54161 Westwood Drive	32.	27919 Westwood Drive
10.	54162 Westwood Drive	33.	54271 Northwood Drive
11.	54179 Westwood Drive	34.	54253 Northwood Drive
12.	54180 Westwood Drive	35.	54239 Northwood Drive
13.	54197 Westwood Drive	36.	54240 Northwood Drive
14.	54198 Westwood Drive	37.	54250 Northwood Drive
15.	54215 Westwood Drive	38.	54274 Northwood Drive
16.	54212 Westwood Drive	39.	54290 Northwood Drive
17.	54231 Westwood Drive	40.	28279 County Road 10
18.	54253 Westwood Drive	41.	28213 County Road 10
19.	54271 Westwood Drive	42.	28330 County Road 10
20.	54287 Westwood Drive	43.	28331 County Road 10
21.	54305 Westwood Drive	44.	28343 County Road 10
22.	27964 Westwood Drive	45.	28369 County Road 10
23.	27948 Westwood Drive	46.	28399 County Road 10

PART III REFERENCES

The references listed below are the documents used in writing the ROD Amendment.

1. EPA, 2003. Proposed Plan Fact Sheet, Himco Dump Superfund Site, Elkhart County, Indiana.
2. EPA, 2003. Himco Dump Superfund Site Supplemental Site Investigation/Site Characterization Report (USACE, 2003).
3. Townsend, T., Chadek, P., Bitton, B., Booth, M., Lee, S., and Yang, K., 2002. "Gypsum Drywall Impacts on Odor Production at Landfills: Science and Control Strategies." A research project sponsored by the Florida Center for Solid and Hazardous Waste Management. Report #00-09.
4. Barnes, K.K., Koplin, D.W., Meyer, M.T. Thurman, E. M., Furlong, E.T., Zaugg, S.D., and Barber, L.B., 2002. Water-quality Data for Pharmaceuticals, Hormones and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: USGS Open-File Report 02-94, URL: <http://toxics.usgs.gov/pubs/OFR-02-94/index.html>, accessed July 17, 2003.
5. Kolpin, D.W., Furlong, E.T., Meyer, M.T., Thurman, E.M., Zaugg, S.D., Barber, L.B., and Buxton, H.T., 2002. Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: A National Reconnaissance: Environmental Science & Technology, v. 36, no.6, p. 1202-1211.
6. EPA, 1996. Final Pre-Design Technical Memorandum, Himco Dump Superfund Site (USACE, 1996).
7. EPA, 1993. Record of Decision, Himco Dump Superfund Site (EPA, September 1993).
8. EPA, 1992. Final Remedial Investigation Report, Himco Dump Remedial Investigation/Feasibility Study, Elkhart Indiana (SEC Donohue Inc, September 1992).
9. USGS, 1982. Hydrologic and Chemical Evaluation of the Ground-Water Resources of Northwest Elkhart County. Water-Resource Investigation 81-53. U.S. Government Printing Office, Washington, D.C.

PART IV RESPONSIVENESS SUMMARY

***Response to the Comments of Bayer Corporation to EPA's Proposed Plan at the
Himco Superfund Site***

I. Executive Summary

General Comment, ES, page 1: In the first few opening paragraphs of the comment package, Bayer has commented *"In connection with the Himco Superfund Site, a site EPA first listed on the National Priorities List in 1989, the data unquestionably demonstrates that there is no risk and only through violations of its own requirements has EPA rationalized its present remedy. The complete lack of data supporting any risk at or near the site means EPA's proposal is arbitrary and capricious and contrary to the law and EPA's authority under the Superfund program."*

EPA's Response: EPA does not agree with this comment. As the Bayer Corporation has indicated, EPA listed the Himco Dump Site as a Superfund site in 1989. Since then the site has been the focus of numerous removal actionsincluding the removal of 71 drums from the site in the area adjacent to the southern residential area (*Final Remedial Investigation Report, Himco Dump, Elkhart, Indiana, August 1992 (RI)*), the provision of municipal water to replace use of contaminated residential well water in the area to the south of the landfill (*Final Remedial Investigation Report, Himco Dump, Elkhart, Indiana, August 1992 (RI)*), and the installation of a fence, posted notices, and other restrictions on the access and use of the property. The Himco Dump Site and surrounding residential areas have also been the sites of ongoing investigations to evaluate the need for a landfill cap to control infiltration, a soil gas collection system to prevent vapor migration, the abandonment and capping of existing and residual residential wells to prevent future use of contaminated groundwater, the provision of municipal water to residents living to the east of the landfill, the ongoing monitoring of water in the vicinity of the Himco Dump, and provisions to restrict access, land use and activities on the landfill which may present a risk to workers, nearby residents, and other receptor populations who may come in contact with contaminated site media by any pathway of exposure. It has only been through these ongoing investigations and collection of additional data that EPA has begun to realize the full extent of the risks posed by the Himco Dump Site, also known as the Himco Superfund Site, which are documented in the *Final Supplemental Site Investigation/Site Characterization Report, Himco Dump Superfund Site*, December 2002 (SSI/SCR).

The full extent of the health burden placed on residents living adjacent to the Himco Dump southern and eastern boundaries can never be known, as pertinent data were not collected to document the magnitude and extent of the contaminant releases in the past. Nor can the full extent of future health impacts on these residents be known with certainty due to the difficulty in providing a complete characterization of the existing contamination and the potential for future releases. EPA has proposed changes to the Himco Site remediation plan with the expectation that such remedies will provide reasonable protection of health to current residents living in the immediate vicinity of the site and other receptor populations who may come in contact with residual contamination still present onsite or moving from the site.

II. Introduction

Comment Section II, page 5: This section includes the following request from the Bayer Corporation: *"Bayer respectfully requests EPA to consider each comment and provide specific responses to each comment."* A large portion of the comments in this package pertain fully or in part to the *Final Remedial Investigation Report, Himco Dump, Elkhart, Indiana*, August 1992 (RI). EPA has previously provided a response to comments submitted on this document (see attachment). However, as much new data was collected and presented in the Final Supplemental Site Investigation/Site Characterization Report *SSI/SCR, Himco Dump Superfund Site*, December 2002, EPA is pleased to have the opportunity to offer new information and perspectives on issues previously raised in the RI.

EPA's Response: The following response to comments is provided by EPA to address those concerns and comments raised by the Bayer Corporation in response to EPA's recommendations for continuing remedial actions at the Himco Superfund Site. The comments will be addressed in detail, in accordance with the section of the comment package in which they are raised. The response to Bayer Corporation's comments follows.

III. Background of Landfill History and Investigations

Comment Section III A, page 7: Bayer has commented: *"Miles, Inc. Used the Himco landfill primarily as a disposal site for calcium sulfate, a non-hazardous, highly impervious material. Calcium sulfate comprises approximately two-thirds of the entire landfill."*

EPA's Response: It is clear that Miles, Inc. also disposed of other materials in the Himco Dump. Both EPA and the Indiana Department of Environmental Management (IDEM) have in their possession a "confidential" list of non-hazardous chemicals disposed of by Miles, Inc. during the time period the Himco landfill was in operation. A parallel list of hazardous material was not supplied by Miles, Inc. However, a number of consumer products were produced by Miles, Inc. during this time period, and remains of these products...whether "off-spec. "or expired preparations...can still be found on the Himco landfill surface and subsurface.

In addition, EPA has conducted, with the assistance of the U.S. Geological Services (USGS), sampling and analysis of "Emerging Contaminants" at one residential groundwater well and two site monitoring wells. "Emerging Contaminants" is the term initially given to those Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants that could be attributable to human or animal wastewater. In the case of the Himco Dump Site, these contaminants are more likely due to direct disposal of these pharmaceutical products in the landfill. A list of chemicals found in the site groundwater samples indicates that such chemicals and contaminant concentrations could only come from disposal of pharmaceutical products in the landfill.

The comment by Bayer Corporation that calcium sulfate comprises two-thirds of the entire landfill is also of interest to EPA. A new and previous unrealized hazard has been identified in connection with the disposal of products containing calcium sulfate in landfills. In a recent

investigation of another landfill in Ohio, it was determined that the calcium sulfate has undergone anaerobic degradation to hydrogen sulfide, a toxic gas that is migrating offsite into nearby residential homes. The breakdown of hydrated calcium sulfate in landfills has been studied by Timothy Townsend et al. of the Florida Center for Solid and Hazardous Waste Management; their report *Gypsum Drywall Impact on Odor Production at Landfills: Science and Control Strategies* is included as an attachment to this Responsiveness Summary. This recent discovery now presents yet a further potential for harm to human health for residents living adjacent to the Himco Superfund Site. Neither the indoor air samples collected in homes to the south of the Himco Dump nor the soil gas samples collected more recently were analyzed for hydrogen sulfide as a site contaminant, leaving one more uncertainty in the risk estimate for these residents.

Comment Section III A, page 7: Bayer has commented: *"The predominance of calcium sulfate in the landfill, versus biodegradable household waste, limits the potential for formation of methane in the landfill, among other benefits."*

EPA's Response: EPA does not agree that the predominance of calcium sulfate limits the potential for formation of methane and other volatile gases, such as the more toxic hydrogen sulfide and other VOCs, produced in the landfill. Figure 1 of Bayer's comment package notes those sampling locations, including locations to the south and southeast of the landfill, at which methane was detected; a number of the sampling locations exhibited levels greater than 25 percent methane. However, of perhaps greater concern is the strong smell of hydrogen sulfide that is emitting from the southeast corner of the landfill. Carbon disulfide was detected in the soil gas samples taken along John Weaver Parkway. Sample TT-56 detected carbon disulfide levels at $19,999\mu\text{g}/\text{m}^3$; ambient air concentrations in the vicinity of the sampling were not measured. Concentrations of other volatile organic compounds (VOCs) detected in this sample included:

- tetrachloroethene ($6,000\mu\text{g}/\text{m}^3$, $34,884\mu\text{g}/\text{m}^3$),
- trichloroethene ($6,600\mu\text{g}/\text{m}^3$, $14,000\mu\text{g}/\text{m}^3$), and
- vinyl chloride ($20,000\mu\text{g}/\text{m}^3$, $16,000\mu\text{g}/\text{m}^3$), as well as other compounds.

Detections of VOCs in soil gas persisted in samples taken east of John Weaver Parkway, even though the samples were collected in April when the ground was no longer frozen and attenuation of the vapors by direct volatilization through the soil would have been expected.

EPA has also noted highly elevated concentrations of calcium in the monitoring well samples and in the samples collected from private residential well samples in the area to the east of the landfill. Calcium levels as high as $205,000\mu\text{g}/\text{L}$ were detected in some residential wells; this level greatly exceeds the recommendations for calcium intake ($60,000\mu\text{g}/\text{day}$) for infants under the age of one year. Both the detections of high concentrations of carbon disulfide in soil gas samples in some areas and the detections of high levels of calcium in residential well water suggest that the calcium sulfate cover is now undergoing deterioration.

Comment Section III B, page 15: In reference to past and current concerns over the

presence of high levels of sodium in site groundwater, Bayer has commented *"EPA took a completely contrary position regarding sodium 12 years later. In the EPA's revised risk assessment in 2002, 'sodium was not retained as a site-related COPC in groundwater', because it is an essential nutrient for the general population."*

EPA's Response: EPA does not agree with this comment. This would appear to be an attempt to deceive the public, as well as a demonstration of a lack of concern for the welfare of the residents to the east of the landfill who currently depend on private residential wells located in off-site groundwater for their drinking water. Although sodium screening level based on a daily dietary goal of 2,400 mg/day was not exceeded, nor was sodium retained in the risk assessment due to the lack of an appropriate toxicity value (reference dose or RfD) for calculating risk, sodium is specifically addressed in the risk assessment. The actual text of the 2002 human health risk assessment for the CDA and down gradient Groundwater, page 9-7, reads:

"Although sodium was not retained as a site-related constituent of potential concern (COPC) in groundwater, it should be noted that EPA's Office of Water has issued a Drinking Water Advisory to provide guidance to communities that may be exposed to drinking water containing sodium chloride or other sodium salts. This advisory recommends reducing concentrations in drinking water to between 30 and 60 mg/L. This range is based on aesthetic (i.e., taste), and would only contribute 2.5-5.0 percent of the daily dietary goal of 2,400 mg/day, if tap water consumption is 2-liters/day (EPA, 2002a). At present, EPA guidance level for sodium in drinking water is 20 mg/L, developed for those individuals restricted to a total sodium diet of 500 mg/day (EPA, 2002a). The maximum detected sodium concentration found in residential wells to the south is 214 mg/L, which is above the advisory level, but below the daily dietary level of 250 mg/L. However, the daily contribution of sodium in the diet through drinking site groundwater would be almost 100 percent, even for an un-restricted diet."

Thus the 2002 risk assessment provides confirmation for on-going release of sodium in residential wells to the south of the Himco landfill and the need to restrict intake of groundwater in this area.

The 2002 human health risk assessment for the Eastern Residential area, page 10-5, contains the following text:

"Although sodium was not retained as a site-related COPC in groundwater, it should be noted that EPA's Office of Water has issued a Drinking Water Advisory to provide guidance to communities that may be exposed to drinking water containing sodium chloride or other sodium salts. This advisory recommends reducing concentrations in drinking water to between 30 and 60 mg/L. This range is based on aesthetic (i.e., taste), and would only contribute 2.5-5.0 percent of the daily dietary goal of 2,400 mg/day, if tap water consumption is two liters/day (EPA, 2002a). At present, EPA guidance level for sodium in drinking water is 20 mg/L, developed for those individuals restricted to a total sodium diet of 500 mg/day (EPA, 2002a). The maximum detected sodium

concentration found in residential wells to the east is 125 mg/L, which is above the advisory level, but below the daily dietary level of 250 mg/L. However, the daily contribution of sodium in the diet through drinking site groundwater would be almost 50 percent."

In addition, the Toxicological Profiles, located in Appendix M, for contaminants considered in the *Final SSI/SCR Himco Dump Superfund Site*, December 2002, contains a complete discussion of the health impacts of sodium ingestion.

Comment Section III B, page 15-16: Bayer has made several comments regarding the evaluated scenarios and pathways and the conclusions of the Baseline Risk Assessment in the *Final Remedial Investigation Report, Himco Dump, Elkhart, Indiana*, August 1992. In these comments, Bayer describes at length the "extreme unlikelihood" that any receptor would be exposed to on-site groundwater or to leachate, and further, uses the words of the remedial site manager to support their position that the site "currently poses no health risk *under any reasonable future exposure scenario*"[EPA's emphasis].

EPA's Response: EPA does not agree with this comment. It would appear that Bayer is trying to create the impression that the 1992 risk assessment or its conclusions were based on a flawed assessment and implausible exposure scenarios. However, EPA is certain that Bayer understands the basis for the 1992 baseline risk assessment decisions. The role of the baseline risk assessment is to develop scenarios for relevant, possible land uses in the absence of institutional controls in order to provide a sound basis for specific remedial actions, such as site deed restrictions for certain future land uses or for specific actions such as the capping of private wells whose use is no longer desirable due to the installation of a municipal water system. At the time the 1992 baseline risk assessment was conducted, residential, agricultural, and industrial uses were all considered possible although their likelihood differs. The possibility of each of these land uses is based on factors including surrounding land use in the area, historical uses of the land (portions of the site were once agricultural) and developmentally feasibility. Additionally, the assessment provided qualitative information on the likelihood of a future land use actually occurring. For example, the Himco site risk assessment clearly stated that there is a low probability of a future residential land use (at least on the landfilled area), there is some likelihood of the site returning to agricultural uses, and there is some probability that the site would be developed for recreational use and indeed development of a golf course was seriously discussed in the very recent past. This type of analysis is useful to all parties, both the potentially responsible parties (PRPs) and EPA risk manager, because it allows the selection of remedial actions on the necessary and anticipated future actions for the site.

It is important to distinguish between the "site" and the "landfill". There is nothing that renders it unlikely that future homes or high-density housing may be built on the site south of the landfill in the future. There are currently homes along County Road 10 south of the landfill. The contaminated area between County Road 10 and the landfill, including the area known as the construction debris area (CDA) is obvious a location where future housing could be constructed. Institutional controls such as zoning prohibitions, fencing, posting of sign and other restrictions cannot ensure that the site will never be used in the future for this purpose. Since there is some

likelihood of some kind of future use for land that is situated in close proximity to the City of Elkhart, and since construction of housing and industrial development has taken place on other landfill sites, it is appropriate for the risk assessment to evaluate such exposure scenarios and for risk management decisions to take this information into account in making site remedial decisions.

While EPA agrees with responsible parties that such assessments are costly and EPA no longer requires an evaluation of such receptor populations or exposure pathways when there is agreement from the community and local land use authorities that a residential land use is not appropriate for a site and deed restrictions in the form of restrictive covenants will voluntarily be placed on the site to prevent such a future land use, assessments which include a range of remedial alternatives that will achieve different land use potentials may still be done when the reasonably anticipated future land use of a Superfund site is uncertain as is the case for the Himco Dump site.

Thus, the fact that Bayer has now issued comments....which seem untimely and naive.....on the past EPA risk assessment practices may suggest that Bayer's comments have been provided for the sole purpose to deceive the public and the legal entities into thinking that the past risk assessment was not conducted in a proper manner. That simply is not the case. Bayer should refer to OSWER Directive No. 9355.7-04, *Land Use in the CERCLA Remedy Selection Process*, dated May 25, 1995, which is included as an attachment to this Responsiveness Summary.

Comment Section III H, page 25, SG #1: Bayer has commented: *"The SSI/SCR provides no information regarding the rationale for the soil gas sampling locations, which are not on a regular grid and may have been biased towards suspect "hot spot" locations."*

EPA's Response: EPA does not agree with this comment. The initial sampling locations proposed for the CDA are contained in the Draft *Work Plan for Supplemental Site Characterization and Access Controls at the Himco Landfill NPL Site, Elkhart, Indiana*, prepared and submitted to EPA by QST Environmental at the request of the Himco PRP Group on January 6, 1998. In section 2.1 of that report, the text states *"Figure 1 shows the 20 proposed boring locations, which represent a triangular grid with a 100-foot interval. A triangular grid is more efficient in detecting randomly located "hot spots" than a rectangular grid of similar dimensions {Gilbert 1987}. The proposed sampling grid provides at least one boring on each residence and provides representative sampling of the Craft and American Electric Power (formerly I&M) properties, as requested by EPA Region V."* A similar grid system was proposed for the soil gas sampling. Section 2.2 of the report indicates that *"Figure 2 shows the 14 proposed soil gas sampling locations, which are set at approximately 200-foot intervals.If many probe points yield methane detections, then a subset of the probes, determined in the field, will be sampled for VOCs, which will entail assuming that the subset of probe locations are representative of the others where methane is detected. In the vicinity of probe points sampled and analyzed for VOCs, additional probes are installed at 50-foot to 100-foot intervals away from the landfill to evaluate attenuation/migration."*

The sampling was never conducted by the PRP Group. EPA undertook this sampling, following the sampling scheme proposed in the Bayer/PRP Group submission. The sampling locations and

sampling pattern are clearly explained in the *Work Plan for the Supplemental Field Investigation at the Himco Dump Superfund Site*, Elkhart, Indiana, March 1998.

“ Previous investigations to characterize soil gas constituents generated from the landfill have focused on the area within the boundaries of the landfill (Donohue, 1992; Quadrel, 1995). The purpose of this soil gas survey at the Himco Dump Site is to determine whether landfill generated constituents in the soil gas are migrating horizontally away from the landfill to the south and east, where residences are located, and to quantify the levels of those constituents which are migrating. One sampling will be conducted during the early summer time frame. The potential for soil gas migration is expected to be greater at this time versus the fall to winter months. Initially, 15 locations will be sampled along the southern and eastern boundary of the landfill (Figure 2). These initial points will be located approximately 50 feet from the landfill boundary and at approximately 200-foot intervals. Constituents to be sampled include methane, hydrogen sulfide, and non-methane VOCs. Where the concentration of methane is detected at concentrations equal to or greater than 25 percent of the lower explosive limit (LEL) at an initial sampling location, then two additional locations will be sampled stepping away from the landfill boundary in order to evaluate the attenuation of the detected constituent(s). Each secondary location will be approximately 70 feet in a direction of 45 degrees either side of the initial sampling location such that the three locations form a triangle. With this sampling configuration, the secondary sampling points will fall on a line parallel to but 50 feet farther away from the landfill boundary. The secondary locations will also be sampled for methane, hydrogen sulfide, and non-methane VOCs. The initial fifteen sampling locations will be designated TT-11 through TT-25 (following the same sample numbering scheme presented in the previously approved FSP prepared by Donohue in 1990). Any additional sample points will be sequentially numbered TT-26 and higher. ”

The *Work Plan for the Phase II Soil Gas Sampling at the Himco Dump Superfund Site*, Elkhart, Indiana, September 1999 provides the strategy and sampling plan for the subsequent Phase II sampling.

Comment Section III H, page 25, SG #2: Bayer has commented: “VOCs were detected in several of these samples, but were generally not detectable near or underneath the residences.”

EPA’s Response: Because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations in homes, the sampling locations are not near (within 10 feet) or underneath the residences, as stated. However, the 2002 EPA OSWER Draft *Guidance for Evaluating Vapor Intrusion to the Indoor Air Pathway From Groundwater and Soils* is based on a three-tiered approach for assessing vapor intrusion, including primary and secondary screening of a site followed by a site-specific pathway assessment. The initial screening is based on the presence of contaminants in soil gas or groundwater within 100 ft of a building designed for human occupancy. The document also discusses the potential for mobile “vapor clouds” (gas plumes) which are caused by methane carrier gas in the vicinity of landfills, and which have been known to travel 100s of feet in distance from the landfill site.

The Phase I and Phase II soil gas sampling conducted in areas both south and east of the Himco Dump site clearly shows that contaminants have been found in soil gas within 100 feet of residential structures. The concentrations of volatile contaminants detected in these soil gas samples suggests the potential for an intact vapor intrusion pathway. Sampling in the area to the east of the site has detected contaminants in soil gas samples taken in public areas both west (between the landfill and the residential structures) and east of the structures, suggesting the homes would be positioned to naturally intercept this vapor movement during periods when the ground is frozen. The soil gas sampling was conducted in accordance with a decision made at a meeting at the Bayer facilities December 14, 1999, in which, both Bayer and EPA agreed that the collection of soil gas samples would provide adequate documentation of a vapor migration pathway and that the collection of indoor air samples in homes would not be desirable or required for future decision-making at the site.

Comment Section III H, page 25, SG #3: Bayer has commented: *"EPA did not perform a health risk assessment for these soil gas concentrations, although they were presumably collected for that purpose."*

EPA's Response: EPA does not agree with this comment. In Chapter 1 of the SSI/SCR, the objectives of the soil gas sampling are clearly explained as noted below:

1998 - Supplemental Site Investigation (Phase I Soil Gas Sampling)

The third objective of the 1998 Supplemental Site Investigation was to obtain soil gas analytical data to assess the occurrence of volatile organic constituents in the soil gas along the southern and eastern perimeter of the landfill. The purpose of the soil gas characterization was to provide EPA Region 5 with additional risk management information. The phase I soil gas investigations were completed in the fall of 1998 in an area immediately adjacent to and south of the landfill boundary, with some data being obtained along the eastern perimeter of the landfill. Only the extent of soil gas migration to the south of the landfill was delineated at that time.

1999 - Supplemental Site Investigation. (Phase II Soil Gas Sampling)

The objective of the 1999 Supplemental Site Investigation was to collect additional soil gas data from an area adjacent to the eastern side of the Himco Dump Site in order to assess the lateral migration of landfill associated gases, to quantify constituent concentrations in soil gas, and to determine whether residences in this area have the potential to be exposed to these constituents in the soil gas.

Because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations, the data were not considered by EPA to be suitable for modeling volatile gas concentrations in ambient (outdoor) air or in indoor air. Therefore, the data were not used quantitatively. However, a qualitative discussion of the soil gas sampling results is presented in Chapter 5 of the SSI/SCR. Figures 5-1 through 5-4 present the contoured concentration data for the compound classes BTEX (benzene, toluene, ethyl benzene and xylene), chlorinated ethenes, chlorinated ethanes and vinyl chloride. All of the listed compound classes, as well as carbon disulfide, were found along the entire length of the southern area outside of the landfill proper

where the sampling was performed.

Comment Section III H, page 26, SG #4: Bayer has commented: *"Because VOCs are not present at unacceptable concentrations at locations underneath any residence, it is impossible for the VOCs to pose an unacceptable health risk to residents via inhalation of indoor household air."*

EPA's Response: EPA does not agree with this comment. The soil gas sampling that EPA conducted in the Phase I and Phase II soil gas sampling events neither confirms or denies that VOCs are present underneath any residences. However the soil gas sampling has demonstrated that VOC gases are present in samples taken south, southeast, east, and northeast of the landfill, and that they are due to the migration of landfill gases from the Himco Dump Site as the VOC concentrations decrease readily with distance from the landfill, as acknowledged by Bayer in these comments.

And as stated in an earlier response, several VOCs have been detected in soil gas within 100 feet of residential structures at concentrations which exceed EPA's screening value of 1×10^{-6} for carcinogens. The concentrations of volatile contaminants detected in these soil gas samples suggests the potential for an intact vapor intrusion pathway.

However, it should be noted that soil gas samples were taken at a time of the year when the preferential VOC migration pathway would be upwards through the soil into the ambient air. During periods when the ground is frozen or otherwise capped by severe rain events, the soil gases would be trapped in the subsurface and the preferential migration for VOCs would be into structures. It is expected that wind forces, large temperature gradients and the operation of home furnaces in closed structures would contribute to the preferential soil gas migration into residences in the winter months, the first two factors acting to increase the "stack effect" or "chimney effect" which causes air to be drawn up and through the structure while the furnace acts to further pump air from the home and increase the soil gas movement into the structure. These events have been effectively demonstrated for the migration of radon gas into structures. For these reason, demonstrations of VOC movement in soil gas into residences are best demonstrated in winter months under closed-house conditions when the ground is frozen.

Furthermore, the concentrations of VOCs in indoor air resulting from VOCs in groundwater released during normal household uses of water from private wells, such as showering and operation of washing machines, dishwashers and humidifiers, are also likely to be the greatest in the winter months, contributing to the total indoor VOC inhalation risk.

All pathways of contaminant exposure must be considered in evaluating whether a target population, such as the residents living in close proximity to the Himco Dump Site, currently have an unacceptable health risk or may have an unacceptable health risk in the future due to contaminants released from the site. When multiple pathways of exposure exist for a receptor population, risks from a single contaminant or single pathway exposure cannot be used to determine the extent of the receptor risk unless the exposure from that contaminant or pathway is several orders of magnitude greater than all other exposures. To evaluate the risk from a single

exposure in such a manner would be incorrect and irresponsible. All sources of VOCs in indoor air need to be considered in an evaluation of the indoor inhalation risk to residents. These risks have not been quantified for the Himco site; however, the contaminant concentrations in soil gas and groundwater samples taken from the site suggest that the presence of these VOCs in indoor air present a health risk to the residents and that the cancer risk exceeds EPA's point of departure of 1×10^{-6} . The magnitude of the total risk, from ingestion and dermal absorption of contaminants in and the inhalation of indoor volatiles from the multiple sources described above, has not been fully quantified for the reasons noted in the preceding comments. It may be necessary to conduct several rounds of indoor air-sampling in residents if such a quantitative evaluation is deemed desirable.

Comment Section III H, page 26, SB #1: Regarding the risk assessment for the CDA soils, Bayer has commented that the *"health risk assessment did not take into account that vegetation will reduce direct exposure to COPCs in surface soil, relative to bare soil."*

EPA's Response: EPA does not agree with this comment. EPA does not consider the presence of vegetation in assessing risk to direct soil contact because EPA cannot guarantee that the soil will always have vegetation or that residents will never use that portion of their residential site for any purpose...including gardening or other landscaping, construction of sheds, garages or other structures, expansion of their outdoor living areas, etc....in either the near or very distant future. Any change in the use of their property may change the health risk to these residents. Furthermore, the CDA presents an attractive nuisance to children, who may play or dig in this area, and it is likely to be frequented by pets who may transport soil contaminants into the indoor environment. Thus to assess the CDA soils in a manner that does not take these considerations into account would be incorrect and irresponsible.

In addition, although the CDA is presently located on both residential and undeveloped commercial/industrial parcels, the land use may change in the future in a manner that would result in frequent exposure to residential or other receptor populations. For this reason, a quantitative measure of the health risks associated with exposure to CDA soils is both necessary and desirable.

Comment Section III H, page 26, SB #2: Regarding the risk assessment for the CDA soils, Bayer has commented that the *"health risk assessment nevertheless shows that all of the residential parcels had an organ-specific Hazard Index (HI) less than one (1), signifying no risk of non cancer effects, and all of the residential parcels had a cancer risk less than 10^{-4} , which is in the acceptable range under Superfund guidance and practice."*

EPAs Response: EPA does not agree with this comment for several reasons. EPA notes that this comment addresses several different and unrelated issues. First, regarding EPA's acceptable risk range, there is no risk within this range that can be characterized as "acceptable" without further evaluation. EPA Headquarter views a 1×10^{-6} risk level as the "point of departure" for requiring further investigation of the hazard, and the 1×10^{-4} risk level as the immediate action or removal trigger level. For everything in between, "it all depends"; EPA does not consider the magnitude of the risk value (the "number") alone but also the assumptions used in the calculation and the uncertainties in the calculated value. Any value in the risk range may trigger a remedial

action. And while a risk in the immediate range may or may not result in some remedial action (a risk management decision), it is clear that there is a risk that exceeds EPA's definition of a minimal risk level (a risk assessment decision). Peter Grevatt, the past EPA Office of Emergency and Remedial Response (OERR) Science Advisor, issued the following guidance on this issue:

"In the discussion of EPA Superfund you MUST include the concept of the point of departure, or else you have significantly misrepresented the program. EPA suggests the following language:

"For example, the Federal Superfund program has established an acceptable range for lifetime excess cancer risks of 1×10^{-4} to 1×10^{-6} . EPA uses the 1×10^{-6} level as a point of departure for corrective actions goals (called preliminary remediation goals) for cancer risks from contaminated sites. While the 1×10^{-6} starting point expresses EPA's preference for setting cleanup levels at the more protective end of the risk range, these levels may be revised within the acceptable risk range based on the consideration of appropriate factors including exposure factors, uncertainty factors, and technical factors."

EPA believes this language provides a better description of the "acceptable risk range" and may be useful for a better understanding of the CDA risk assessment.

Secondly, not all land parcels, either residential or commercial, were sampled. Soil samples were obtained from parcels D, F, M, O, P and S only. No soil samples were collected from land parcels N, Q, R, and T. The risks from direct contact to soils in the latter parcels were determined using geostatistical methods to project contaminant concentrations in these parcels, and were based the modeling of two constituents only. Even in those parcels that were sampled, sampling was sparse. The CDA soils have not been fully characterized, and it is highly likely that not all CDA soil contaminants were identified nor were the highest contaminant concentrations determined. The risk estimates for the CDA soils are highly uncertain. However, it was never the intention to fully characterize the CDA soils in these screening samples. Indeed, Bayer had previously submitted, through its contractors, a Work Plan for the sampling of the CDA for the purpose of determining if the soil contained any constituents that presented a risk to human health; EPA, through it's contractor, completed this task. The screening sampling was to indicate a potential for concern in CDA soils.....which has been done.

Thirdly, the conclusion from the screening sampling is that contaminants may be present anywhere in the CDA soils at concentrations that could exceed risk levels. This is true because not all parcels were sampled and those that were had very sparse sampling. A final conclusion of the CDA analysis, as stated in Chapter 11 of the SSI/SCR, is that "CDA soils have demonstrated a potential risk from repeated exposure and should be removed."

Fourthly, in Chapter 11 (Conclusions), the risk assessment reads "Soil samples collected from the Construction Debris Area demonstrate the presence of polynuclear aromatic hydrocarbons (PAHs) and the metals aluminum, antimony, arsenic, copper, manganese, mercury, lead and nickel at concentrations that may be associated with CDA dumping activities. The VOCs 1,1-dichloroethane, benzene, ethylbenzene, and xylene were detected in one sample with no other site related VOCs reported." In addition, lead was detected above the residential screening level in land parcel F in one surface soil sample at an estimated concentration of 695mg/kg. Lead

was also detected in other surface, near surface and subsurface soil samples at land parcels F, D, S and O (no soil samples were collected at Land Parcel N, R, Q and T). Although the concentrations detected were below the screening level, the concentrations represent lead concentrations in unsieved samples. It has been determined that lead concentrations in soil generally increase with decreasing particle size; concentration factors of 1.4 and greater for the fine fraction of soil that most readily sticks to children's hands (the ingestible fraction as determined by sieving of the soil) been reported at Superfund sites. Therefore, use of the total soil concentrations likely underestimates the overall child health risk to lead in the identified parcels.

Comment Section III H, page 27, SB #3: Bayer has commented that *"the health risk assessment demonstrates that COPC concentrations in CDA soils on residential parcels do not pose any unacceptable health risk to on-site residents and do not warrant remedial action under CERCLA."*

EPA's Response: EPA does not agree with this comment. Bayer's comment addresses parcels that are currently used for residential land use only. EPA has evaluated the cancer risks for a combined child/adult resident and for a construction worker and the non cancer risks (HIs) for a child resident and for a construction worker at all land parcels, both residential and undeveloped commercial/industrial parcels, in accord with the assumptions stated previously, that it is important to distinguish between the "site" and the "landfill". There is nothing that renders it unlikely that future homes or high-density housing may be built on the site south of the landfill in the future. There are currently homes along County Road 10 south of the landfill. The contaminated area between County Road 10 and the landfill, including the area known as the construction debris area (CDA) is obvious a location where future housing might be constructed. Institutional controls such as zoning prohibitions, fencing, posting of sign and other restrictions cannot ensure that the site will never be used in the future for this purpose. Since there is some likelihood of some kind of future use for land that is situated in close proximity to the City of Elkhart, and since construction of housing and industrial development has taken place on other landfill sites, it is appropriate for the risk assessment to evaluate such exposures and for risk management decisions to take this information into account in making site remedial decisions.

When all receptor populations are considered, the cancer risk to the resident from exposure to the CDA soil in all parcels was estimated to range from 1.9×10^{-5} (in unsampled parcel N) to 1.5×10^{-4} , with the risk at or exceeding 1×10^{-4} in two parcels (F and S). The cancer risk range for a construction worker from exposure to CDA soils was 1×10^{-6} to 4.6×10^{-6} . The non cancer risk (HI) to the residential child due to exposure to CDA soil was estimated to range from 0.11 (in unsampled parcel N) to 4.5 (in parcel F due to arsenic and the non cancer effects of benzo-a-pyrene). The non cancer risk (HI) to a construction worker in parcel F was estimated at 1.3; no other parcel had an unacceptable non cancer risk (HI or HQ > 1.0). Thus it is clear that both cancer and non cancer estimated risks exceed an unacceptable risk level at some parcels in the CDA. And as previously stated, sampling of the parcels was sparse and not all land parcels were sampled, so there is great uncertainty as to whether these estimates are inclusive of all CDA soil constituents or are representative of the maximum risks that might be expected from exposure to the CDA soils.

Comment Section III H, page 27, SB #4, footnote 91: In support of the above comment (SB #3), Bayer has included foot 91: *"See SSI/SCR, at Tables 9-11 (Parcel M), 9-12 (Parcel O), Table 13, (Parcel N), Table 9-14 (Parcel P), and 9-16 (Parcel T) and page 9-52; Non-residential parcels O (see Table 9-17), R (see Table 9-17), and D (see Table 9-20) also met these no-risk criteria;"*

EPA's Response: EPA does not agree with this comment. As is clearly stated in the SSI/SCR, land parcels N, T, Q and R were not sampled. The projected risks are based on geostatistical modeling of two contaminants only, arsenic and benzo(a)pyrene, and thus are highly uncertain.

Comment Section III H, page 27, GW #1: Regarding the groundwater sampling conducted between September 1996 through September 2000, Bayer has commented that *"Twenty-eight (28) of the 40 target analytes in the VOC list were not detected in any sample; none of the remaining 12 VOCs exhibited detected concentrations that exceeded a primary MCL, a standard of safety for public drinking water supplies."*

EPA's Response: Bayer's comment confuses the difference between risk-based values and Maximum Contaminant Levels (MCLs), which are significant. MCLs are enforceable single constituent, single pathway (ingestion) standards based on a combination of risk, technical feasibility, and economics, which are applicable to public drinking water supplies. A risk assessment seeks to evaluate the potential risks from exposure to all constituents in all media by all pathways of exposure. Remedial actions at Superfund sites, by law, seek to reduce overall site risks to an acceptable level for the site; this necessitate the cleanup of some constituents to less than their respective MCLs.

Another significant difference that should be noted is that EPA used groundwater data from the 1990 through 2000 sampling events. In monitoring well pair WT116A and WT119A, located in the CDA down-gradient of a major drum removal activity on the Himco Dump Site, the carcinogens arsenic, benzene, bis(2-ethylhexyl)phthalate, carbazole, 1,2-dichloropropane, trichloroethylene and vinyl chloride were detected at significant levels in the samples taken in the period between 1990 and 2000; the non-carcinogens antimony, iron, manganese, sodium, thallium, 1,1-dichloroethane and 1,2-dichloroethene were also detected.

In samples from monitoring wells WT101A, WT114A, WT114B, and from geoprobe locations GP16 (all depths), GP101 (all depths) and GP114 (all depths), the carcinogens arsenic, benzene, bis(2-ethylhexyl)phthalate, 1,2-dichloropropane, and trichloroethylene were detected at significant levels; the non-carcinogens carbon disulfide, chloroethane, chromium, iron, manganese, sodium, 1,1-dichloroethane and cis-1,2dichloroethene were also detected.

EPA has also explained in the SSI/SCR that not all constituents will be detected at all monitoring depths in the aquifer. Constituents may stratify in the aquifer; at one Superfund site (Evergreen Manor, Roscoe, Illinois), acetone was consistently found at a depth of 30 feet in the aquifer. The geoprobe sampling was conducted to provide continuous data over a wider sampling depth in order to provide a contaminant profile of the aquifer in the area adjacent to the eastern

boundary of the residential area. However, such sampling was not conducted in other areas of the aquifer, and a complete characterization of the contaminant pattern is not available at this time. This further contributes to the uncertainty in the risk assessment.

Comment Section III H, page 28, GW #2: Regarding the sampling of residential wells located to the east of the landfill conducted in 2000, Bayer has commented that *"For 11 of these 13 locations, the residential well sampling data do not exhibit the presence of chemicals of potential concern (COPC) at concentrations that exceed primary MCLs."*

EPA's Response: Bayer's comment again confuses the difference between risk-based values and MCLs, which are significant. MCLs are single constituent, single pathway (ingestion) standards based on a combination of risk, technical feasibility, and economics which are applicable to public drinking water supplies. A risk assessment seeks to evaluate the potential risks from exposure to all constituents in all media by all pathways of exposure. Remedial actions at Superfund sites, by law, seek to reduce overall site risks to an acceptable level for the site; this may necessitate the cleanup of some constituents to less than their respective MCLs.

In samples taken from residential wells, the carcinogens arsenic, benzene, chloroform, 1,2-dichloroethane (EDC), 1,2-dichloropropane and vinyl chloride were detected at significant levels; the non-carcinogens calcium (at highly elevated levels), iron, manganese, sodium, sulfate, 1,1-dichloroethane and cis-1,2-dichloroethene were also detected. The constituents detected in residential well water are consistent with those detected in wells in the CDA and in eastern down-gradient wells.

Comment Section III H, page 28, GW #3, footnote 96: In support of the above comment (GW #2), Bayer has included footnote 96: *"Iron and manganese in certain residential water samples exceed their respective secondary MCLs, which are not enforceable and are based upon aesthetic considerations."*

EPA's Response: Bayer has failed to note that the levels of manganese detected in one residential well were 1,560 micrograms per liter ($\mu\text{g/L}$) and 1,880 $\mu\text{g/L}$, which is a level that greatly exceeds the secondary MCL of 50 $\mu\text{g/L}$, as well as the generic screening value of 880 $\mu\text{g/L}$ for a Hazard Quotient (HQ) of 1.0 for prevention of impairment of neuro-behavioral function. Bayer also did not note that levels of iron in 3 residential well exceeded 5,000 $\mu\text{g/L}$ (the highest was 6,120 $\mu\text{g/L}$). In 1989, the Food and Nutrition Board of the National Research Council set the Recommended Dietary Allowance (RDA) for iron based on gender and age. However, a new report (2002) from the National Academies of Sciences (NAS) set the RDA for iron for men and post-menopausal women at 8 milligrams per day (8,000 $\mu\text{g/day}$) and the RDA for infants under the age of one year at 6 milligrams per day (6,000 $\mu\text{g/day}$). These levels would likely be exceeded in these populations if residential well water is consumed at the usual rate at these residences, and may contribute to adverse gastrointestinal effects, including abdominal pain, nausea and vomiting.

However, EPA finds it problematic that Bayer did not mention the extremely high levels of calcium and sodium found in these residential wells. While calcium is an essential element and is necessary for building bones and teeth, and in maintaining bone strength, calcium levels in eight

residential wells ranged from 100,000µg/L to 205,000µg/L. The National Academy of Sciences (NAS) Institute of Medicine has established (in 1999) an upper intake level (ULs) for calcium of 2,500mg per day for all age groups over 1 year of age and for pregnant and lactating females. For infants, ULs were not determined for calcium because of the lack of data on adverse effects in this age group and concern regarding infant's possible lack of ability to handle excess amounts. However, a recommended maximum intake for infants is 60,000µg/day. The NAS indicates that caution is warranted, and food should be the source of intake by infants. The UL critical adverse effect for infants ingesting excess calcium is milk-alkali syndrome.

In addition, sodium levels found in five residences ranged from 44,400µg/L to 126,000µg/L. EPA Office of Water has issued a Drinking Water Advisory to provide guidance to communities that may be exposed to drinking water containing sodium chloride or other sodium salts. This advisory recommends that sodium concentrations in drinking water not exceed a range of 30.0mg/L to 60.0mg/L (30,000µg/L to 60,000µg/L). This range is based on aesthetic effects (i.e., taste), and contributes 2.5 - 5.0 percent of the RDA of 2,400mg/day, if tap water consumption is two-liters/day. At the present time, EPA guidance level for sodium in drinking water is 20mg/L (20,000µg/L) developed for those individuals restricted to a sodium diet of 500mg/day. EPA requires public water systems that exceed 20.0mg/L to notify local and State public health officials. The levels of sodium found in these residential wells greatly exceeds these EPA guidelines.

Comment Section III H, page 28 and 29, bullets, GW #4: In these two bullets, Bayer discusses the concentrations for two contaminants in residential well samples that exceed primary MCLs, methylene chloride and 1,2-dichloropropane, commenting that although these contaminants exceeded their respective MCLs of 5.0µg/L for methylene chloride and 5.0µg/L for 1,2-dichloropropane, they "*were below the "trigger" concentration that would pose an unacceptable cancer risk*". Bayer further comments that "*the reported detection of 1,2-dichloropropane [detected three times between 8.0µg/L and 10.0µg/L, which is above the MCL of 5.0µg/L but below the emergency removal value of 16.0µg/L] in water samples from the residence served by RW-22 does not represent an unacceptable health risk.....*"

EPA's Response: EPA does not agree with this comment. It is clear that Bayer has confused the "trigger" level concentrations, which are single contaminant, single pathway (ingestion) values used by EPA for the purpose of determining the need for an Emergency Removal Action, including the removal of residents from the properties in some cases, with acceptable risk levels. Acceptable risk levels of contaminants in groundwater, and other media, are based on a determination of the impacts to human health of exposure to multiple contaminants by multiple pathways of exposure. Thus trigger levels for single contaminants are often set at high risk levels (a 1×10^{-4} risk level for carcinogens and a HQ of 1.0 for non-carcinogens), at which there is no question that continued exposure to the resident population would be unacceptable for even a short period of time and immediate action is warranted. Fortunately, these levels have not been detected in residential well water samples, or this discussion would be moot. In addition, EPA finds this comment inconsistent with the GW #1 comment above in which Bayer has stated "*none of the remaining 12 VOCs exhibited detected concentrations that exceeded a primary MCL, a standard of safety for public drinking water supplies.*"

Comment Section III H, page 29, 2nd bullet, GW #5: In this bullet, Bayer has commented that *“Well RW-22 was the only residential well with any detection of 1,2-dichloropropane;”* and *“1,2-dichloropropane was not detected in any sample from shallow monitoring well 114A or deeper well MW114B, nor was it ever detected in any groundwater sample from monitoring well WT01, which is the only other monitoring well located along the eastern boundary of the landfill.”* Bayer has thus commented that *“Given these considerations, the reported detection of 1,2-dichloropropane in water samples from the residence served by RW-22.....may not be site-related.”*

EPA’s Response: EPA does not agree with this comment. Earlier groundwater sampling may not have detected the presence of 1,2-dichloropropane (and many other VOCs present in the groundwater at low concentrations, including those with low maximum contaminant level (MCL) values due to the high detection limits used during analysis of groundwater samples at that time.

However, 1,2-dichloropropane was detected in the 1996 groundwater sampling in WT116A (at 2.0µg/L) and in the April/May 2000 sampling of WT116A (at 1.0µg/L, duplicate 1.0 µg/L), indicating the presence of on-site contamination. WT116 is located immediately down-gradient of the site’s past drum removal activities conducted by EPA. 1,2-dichloropropane was detected during the direct push groundwater sampling collected on the eastern boundary of the Himco Dump site in 2000 in GPE-1 (0.5µg/L), GP114-2 (2.0µg/L) and GP16-1 (2.0µg/L), demonstrating migration of this contaminant in groundwater to the east of the site; all direct push samples were collected from 30 to 39 feet below ground surface (bgs). Direct push samples were collected to confirm the presence or absence of constituents that may contribute to the Himco area groundwater risk, to determine the degree to which groundwater at the Himco Dump Site is currently being affected in both a horizontal and vertical sense by the landfill, and to define any temporal/spatial patterns or trends in the groundwater geochemistry related to the landfill.

Finally, 1,2-dichloropropane was detected in residential well RW-22 on three occasions in 2002. Bayer has chosen not to include the 2000 direct push sampling locations in their Figure 2-A or to comment on these detections.

In addition, it should be remembered that 1,2-dichloropropane does not occur naturally in the environment. It is moderately soluble in groundwater, and has been found at only 26 of 1,177 NPL identified by EPA (ATSDR, ToxFAQs, April 2003). In recent years, almost all of the available 1,2-dichloropropane has been used as a chemical intermediate to make perchloroethylene and other chlorinated chemicals.

Comment Section III H, page 29, GW #6: Bayer has commented that several (three) lines of evidence suggest that the Himco landfill is not the source of the VOCs detected in certain residential wells east of the landfill. Bayer has further commented that there is *“no evidence that the groundwater underneath the landfill flows to the east”* and that *“The RI reported that groundwater flow is southerly underneath the landfill....”*

EPA’s Response: EPA does not agree with this comment. Section 3.1 of the SSI/SCR contains a discussion of the groundwater flow at the Himco Dump site. As the report states:

“Two water level surveys were completed between March and April of 2000 to assist with the interpretation of groundwater flow directions at different depths within the aquifer beneath the Himco Dump Site. Groundwater levels and elevations for the April 2000 event are summarized in Table 3-1. The water level data were grouped and contoured according to monitoring well screen depths. Data for shallow levels of the aquifer were obtained from monitoring wells screened across or within approximately 30 feet of the water table (shallow monitoring wells). Data for intermediate levels of the aquifer were obtained from monitoring wells screened approximately 60 to 100 feet below ground surface (intermediate monitoring wells), and data for deep levels of the aquifer were obtained from monitoring wells screened greater than 100 feet below ground surface (deep monitoring wells).

The results of contouring the April 2000 shallow monitoring well data are shown in Figure 3-1. Overall, groundwater at or near the water table appears to be flowing predominantly to the south-southeast across the Himco Dump Site; however, local variations in the flow direction are apparent. [Emphasis by EPA] These local flow variations may in part be the result of unequal monitoring well distribution across the Himco Dump Site, which results in more speculation in the interpolation of groundwater elevation contours in areas with a lesser density of sampling points. The overall direction of groundwater flow is consistent with other published regional and site-specific interpretations of groundwater elevation data (Imbrigiotta and Martin, 1981; Duwelius and Silcox, 1991; Donohue, 1992).

Groundwater flow in the southern portion of the site where shallow monitoring well density is the greatest is towards the south to southwest. The gradient appears to steepen significantly in the vicinity of the landfill proper near monitoring well WT103A. One possible explanation for this increased gradient is a localized mounding effect from two ponds located immediately adjacent to and north (up gradient) of WT103A. Another possible cause for the groundwater gradient to steepen in the vicinity of WT103A is mounding of the water table beneath the landfill. Neither of these scenarios can be verified given the current number and distribution of monitoring wells or the number of monitoring events; however, groundwater elevation data obtained during the RI supports the interpretation that the ponds exert some control on the groundwater flow. A comparison of groundwater levels obtained during the RI from staff gauges installed in all three ponds at the Himco Dump Site and surrounding monitoring wells showed close correlation in water table elevations. This would indicate that the ponds act as a recharge source for the aquifer, but mounding of the water table does not occur as a result of their existence. It is more likely that the increase in the water table gradient seen in Figure 3-1 is related to the existence of material of different hydraulic conductivity (i.e. landfill-related material).

Groundwater flow directions and gradients for the central portion of the site are highly speculative as no monitoring wells exist in this region. [Emphasis by EPA] One possible scenario involves mounding of the water table underneath the landfill as suggested above. In this case, the landfill could exert a significant amount of influence on the groundwater gradient, and potentially the flow direction. The red colored contours shown in Figure 3-1 are one interpretation of the groundwater flow regime involving groundwater mounding and radial flow away from the landfill. The groundwater flow direction is shown to vary widely in the central portion of the site from south to east to northeast, depending on the location relative to the landfill boundary.

Another data interpretation where there is no mounding effect from the landfill is shown on Figure 3-1 by the blue colored contour lines. [Emphasis by EPA] In this scenario, the groundwater flow direction is shown to flow more consistently in a south to southeast direction.

Groundwater flow at or near the water table in the northern part of the site is towards the southeast as shown in Figure 3-1. The interpolated contours are based on a somewhat limited number of data points. [Emphasis by EPA]

April 2000, contoured groundwater elevation data from the intermediate monitoring wells (Figure 3-2) indicates flow predominantly to the southeast, with a southwest flow component in the southwest corner of the site. [Emphasis by EPA] In general, the overall flow direction in the intermediate levels of the aquifer is similar to that in the shallow levels. The effects of the mounding due to the landfill and/or the ponds is expected to be dissipated by the intermediate level of the aquifer because of the high hydraulic conductivities. A more detailed discussion on hydraulic conductivities of the aquifer beneath the Himco Dump Site can be found in Chapter 7.

There is an insufficient amount of monitoring wells to contour the April 2000 water elevation data for deep levels of the aquifer.

Comment Section III H, page 31, GW #7: Bayer has commented that “EPA has not established that the VOCs detected in samples from certain residential well east of the landfill are due to the Himco landfill.”

EPA’s Response: EPA does not agree with this comments. In GW comment #5 above, EPA has responded:

“1,2-Dichloropropane was detected in the 1995 groundwater sampling in WT116A (at 4.0µg/L), in 1996 (at 2.0 µg/L), and in the April/May 2000 sampling of WT116A (at 1.0µg/L, duplicate 1.0 µg/L), indicating the presence of on-site contamination. Monitoring well WT116 is located immediately down-gradient of the site drum removal activities conducted by EPA. 1,2-dichloropropane was detected during the direct push groundwater sampling done on the eastern boundary of the Himco Dump site in 2000 in GPE-1 (0.5µg/L), GP114-2 (2.0µg/L) and GP16-1 (2.0µg/L), demonstrating migration of this contaminant in groundwater to the east of the site; all direct push samples were located from 30 to 39 feet bgs. Finally, 1,2-dichloropropane was detected in residential well RW-22 on three occasions in 2002. Bayer has chosen not to include the 2000 direct push sampling locations in their Figure 2-A or to comment on these detections.”

Similar analogies can be developed for benzene, vinyl chloride, trichloroethylene, 1,1-dichloroethane, 1,2-dichloroethene, and other VOCs and metal contaminants found in on-site groundwater samples.

Comment Section III H, page 31, GW #8: Bayer has commented that “The SSI/SCR did not present a quantitative health risk assessment based on residential well sampling results and did not provide any reason why none was prepared.”

EPA’s Response: EPA does not agree with this comment. In Chapter 4.0 of the

SSI/SCR, the criteria for use of data in a quantitative risk assessment are discussed in detail. And, in Section 4.2.7, EPA has explained that *"The residential well analytical data, collected during the March, April/May and November 2000 sampling events, meet the five criteria established in Section 4.1, and are usable in a quantitative manner and to qualitatively support the risk assessment which follows in this report with the exception of the metals/cyanide data collected during the March and April/May 2000 and the emerging contaminants data. The metals data obtained from residential water well samples collected during the March and April/May 2000 sampling events are unusable in a quantitative manner or to qualitatively support the risk assessment as no turbidity measurements were obtained during the sampling process."* [EPA's emphasis.]

It should be obvious to those who understand the risk assessment process that there would be no benefit gained by conducting a partial risk assessment using the VOC contaminants only, and indeed, this is what the above discussion was intended to convey. The inability to develop risk estimates using all the groundwater contaminants and pathways of exposure to groundwater makes such an exercise meaningless, if not undesirable. Thus as stated, the data from monitoring well and direct push sampling was used in the estimation of risk to the residents living to the east of the landfill. In those cases where the contaminant concentrations were less than that detected in the residential wells (for example, the use of 2.0µg/L instead of 10.0µg/L for the detection of 1,2-dichloropropane), the risk to the eastern residents has been underestimated.

In addition, EPA has noted that *"The emerging contaminants data do not meet all of the five criteria established in Section 4.1, as discussed above for the monitoring well data. Additionally, these data were collected for information purposes only."*

Comment Section III H, page 31, GW #9: Bayer has commented that *"The EPA, therefore, has not established that the detected VOC concentrations pose unacceptable risks to any residents."*

EPA's Response: EPA does not agree with this comment. In addition, EPA does not understand why the clear statements that several contaminant concentrations in the residential well samples, notably the VOCs 1,2-dichloropropane and methylene chloride, exceed their respective MCL values in the residential well samples does not suggest to Bayer that these VOC concentrations pose unacceptable risks to these residents. Bayer has previously commented in GW #1 that *"a primary MCL, [is] a standard of safety for public drinking water supplies."*

In addition, in section 10.8.3 of the SSI/SCR, EPA has clearly explained the differences between the data set used in the groundwater evaluation for the residents to the east of the landfill, noting that the assessment in the report likely constitutes an under-estimation of the risk to these residents from ingestion and inhalation of contaminants in their private well water. The SSI/SCR reads:

"In addition to the carcinogenic and non-carcinogenic risks described above that are based on analytical data gathered from groundwater monitoring wells and/or direct-push points located east of the Himco Dump Site, analytical data was collected from private wells used by

residents east of the Himco Dump Site. The data collected from these wells are summarized in Chapter 3. All of the constituents detected in the private wells were also present in the groundwater and direct-push points except for the following (i.e., these constituents were not detected in the groundwater data set used in the risk assessment): vinyl chloride, 1,2-dichloroethane, chloroform, and copper were detected at maximum concentrations (based on residential well sampling events in March, April and November) of 0.9µg/L, 1.0µg/L, 0.4µg/L and 66.1µg/L, respectively. All of these maximum concentrations are above their respective Region 9 preliminary risk goal (PRG) screening values, except for copper.....” Thus, it should be apparent that exposure to the residents from these additional contaminants would also contribute to the risk estimate, and would likely increase the risk estimate.

Further, the text continues to explain: “An additional constituent 1,2-dichloropropane (evaluated in the risk assessment and also detected in one residential well) was evaluated in the risk assessment at a concentration less than the maximum detected concentration in the residential well (sampled over the three events). The carcinogenic risk for this constituent is 2.21×10^{-6} and the non carcinogenic risk hazardous index (HI) is 3.2. These risks are based on a concentration of 2.0µg/L; the maximum concentration in the residential well is 10µg/L. Therefore, the risks to the residents east of the Himco Dump Site may be underestimated. In addition, the residential well concentration exceeds the for 1,2-dichloropropane of 5.0µg/L.” EPA expects that even a casual reader would be able to calculate the risks from exposure to 1,2-dichloropropane, given this information, as a cancer risk of 1.1×10^{-5} , and a non carcinogenic risk hazardous quotient (HQ) of 16.0.

The SSI/SCR also reads that “Methylene chloride was also detected in one residential well at a maximum concentration of 6.0µg/L. This concentration exceeds the MCL of 5.0µg/L. The risk to methylene chloride was not evaluated; the maximum concentration detected in the groundwater data set used in the risk assessment was 0.7µg/L and was below the Region 9's PRG screening value of 4.3µg/L. Therefore, the risks to the residents east of the Himco Dump Site may be underestimated due to the potential additional risk to methylene chloride not addressed in the risk assessment.” Given that the Region 9 PRP screening value represents a 1×10^{-6} risk, EPA expects that even a casual reader will understand that the estimated cancer risks from these two unevaluated contaminant concentrations alone would be approximately 1.2×10^{-5} (1.1×10^{-5} for 1,2-dichloropropane and 1.4×10^{-6} for methylene chloride), while the non carcinogenic risk would be greater than 16.0 (where a HQ of 1.0 represents a clear potential for adverse health effects). The estimated risks from these two contaminants in residential well water are in addition to the other contaminants considered in the assessment and also in addition to the risks from the contaminants cited above which were not considered in the risk estimates to residents to the east of the Himco Dump Site. Under no circumstance can it be considered that there is no significant risks to residents living to the east of the Himco Dump site from exposure to residential well water.

EPA also notes that several uncertainties exist in the risk estimates which lend further concern to these estimates: only a few residential wells were sampled and so it is not known how many wells in the area have concentrations as high, or potentially higher, of these contaminants in their well water; it is not known whether these concentrations are the maximum concentrations that are present in the residential wells today or whether they have been higher in the past or will be higher

in the future; and it is not known if residents install new wells, which are screened at a different depth in the future, they will have higher or lower concentrations of contaminants in their residential well water in the future.

Comment Section III H, page 31, GW #10: Bayer has commented that the “*monitoring well data [used in the health risk assessment for the residents east of the Himco Dump Site] exhibited important differences from the residential well data regarding the substances detected and their sample concentrations.*” However, Bayer comments only on the arsenic detections, as follows “*The most important of these differences pertains to arsenic, which was detected in residential well samples from only four of the 13 tested wells (representing only eight out of 25 samples).*”

EPA’s Response: EPA does not agree with this comment. Bayer’s initial comment that “*monitoring well data exhibited important differences from the residential well data regarding the substances detected and their sample concentrations.*” Suggests that Bayer fully understands that the risk estimates for the residents to the east may be underestimated, as discussed in the above GW comment.

The concentration of arsenic in the monitoring well data set, based on the highest detected concentration of 24.3µg/L in WT114A, the only monitoring well located to the east of John Weaver Parkway, was used to derive a cancer risk of 5.4 in 10,000 (5.4×10^{-4}) from ingestion of well water; this level clearly exceeds EPA’s newly (enforceable) MCL. However, it is clear that arsenic is present in residential wells as well. The lowest arsenic concentration detected in WT114A was 9.0µg/L, which was detected during the time period when the residential wells were sampled and which is similar to the arsenic concentration of 8.0µg/L detected in an adjacent residential well. The latter concentration contributes a cancer risk of 1.8 in 10,000 (1.8×10^{-4}) to the total residential cancer risk (in addition to the risks of 1.2×10^{-5} from the VOCs discussed in the proceeding response) from contaminants detected in residential wells. Thus the risks from exposure to arsenic in the residential well water alone presently exceeds EPA’s cancer risk level of 1×10^{-4} . As the residential wells were not sampled in 1995 and 1998, when arsenic concentrations of 23.3µg/L and 24.3µg/L, respectively were detected in WT114A, it cannot be known if the arsenic concentrations in the residential wells were also higher during this time period.

In addition, EPA does not understand the implications of the comment that arsenic was detected in only 4 of the 13 locations tested. EPA has explained that the residential wells are screened at differing depths in the groundwater aquifer and that groundwater flow in the area has not been completely characterized; thus contaminant concentrations would be expected to differ in the individual residential wells. And, as discussed above, EPA has also expressed further concern over these risk estimates due to several uncertainties: only a few residential wells were sampled and so, it is not known how many wells in the area have concentrations as high, or potentially higher, of these contaminants in their well water; it is not known whether these concentrations are the maximum concentrations that are present in the residential wells today or whether they have been higher in the past or will be higher in the future; and it is not known if the residents install new wells which are screened at a different depth in the future, they will have higher or lower

concentrations of contaminants in their residential well water in the future.

Comment Section III H, page 32, GW #11: Bayer has commented that the “*The SSI/SCR also did not mention that its lifetime cancer risk estimate, based upon the monitoring well data, would also have been in the acceptable risk range (i.e., less than 1×10^{-4}) if the arsenic had not been included in the health risk assessment as a site-related COPC.*”

EPA’s Response: EPA does not agree with this comment. The SSI/SCR clearly states that the non carcinogenic risk for a child resident has a HI of 29.0, of which multiple contaminants in water contribute HQ’s greater than 1.0 to the total estimate. The non carcinogenic risk is clearly outside EPA risk management range. Regarding the “what if” comment pertaining to the carcinogenic risks, it is also clear that multiple contaminants have contributed to the cancer risk estimate derived from the monitoring well and direct-push point data, including benzene, 1,2-dichloropropane and other contaminants (such as vinyl chloride and methylene chloride which were not included in the assessment). Thus EPA finds this comment to be meaningless, because a detailed discussion which compares and contrasts the impacts on the risk estimates from every contaminant to which these residents may be exposed, by any pathway of exposure, using either the monitoring well data or the individual residential well data, would be nonsense, given the paucity of the data that is available to make such assessments. Such a discussion would also not contribute meaningful information for the risk management of the site.

Comment Section III H, page 32, GW #11: Bayer has commented that the “*The RI and USGS data demonstrate that systematic sampling of an extensive network of background well is required to adequately characterize background groundwater quality and its natural variability. SSI/SCR, nevertheless, used only two wells to characterize shallow groundwater quality...*”

EPA’s Response: EPA does not agree with this comment. But EPA does agree that an extensive network of monitoring wells is usually required to adequately characterize contaminant releases to groundwater, even over relatively small release areas. However, the SSI/SCR background groundwater data does demonstrate that the background constituent concentrations have varied very little over the time period of the groundwater data collection for the report. For the contaminant of most interest in this discussion (arsenic), the detected concentrations have remained relatively stable. In the up-gradient wells that Bayer has suggested as potential background wells, the arsenic concentrations were as follows: in WT102A, non-detect over the period of 1990 to 2000 (6 sampling events); in WT102B, non-detect (1/1991), 2.0µg/L (9/1991), 4.8µg/L (1995), 6.0µg/L (2000); in WT112A, non-detect over the period of 1995 to 2000 (three sampling events); in WT112B, non-detect (1995), 5.0/4.0µg/L (2000/duplicate); and in WT113A, non-detect over the period of 1995 to 2000 (two sampling events), and WT113B, non-detect (1995) and 3.0µg/L (2000).

Comment Section III H, page 32, GW #12: Bayer has commented that the “*Finally, the SSI/SCR did not present a risk characterization for background groundwater quality, as required by EPA guidance for sites with naturally elevated concentrations of arsenic, iron and manganese. As a result, the SSI/SCR presents an incomplete and inaccurate characterization of background groundwater quality and cannot be relied upon as a sole basis for assessing which COPCs are*

site-related in groundwater."

EPA's Response: EPA does not agree with this comment. EPA does not agree that the concentrations of arsenic, iron or manganese are naturally elevated at the Himco Dump Site. High arsenic concentrations of 54.5µg/L have been detected at WTE2 in the southeast corner of the site, a highly contaminated area, and at 46.0µg/L in WT106A, located southeast of WTE2, and at 23.3/24.3µg/L in duplicate samples in WT114A, located to the southeast of the Himco Dump site. These concentrations are approximately an order of magnitude greater than those detected in wells located up gradient of the site. In addition, these elevated concentrations of arsenic occurred during different time period, suggesting that some activity, such as the operation of the Bayer pumping station located to the east of the residential area, may have influenced the direction and rate of groundwater flow during the period when it was operating.

Comment Section III I, page 35, PP #1: Bayer has commented that "*The 2003 Proposed Plan is unnecessary to protect public health, based upon the following*"; a list of bullet points follows.

EPA's Response: EPA does not agree with this general comment or the comments in any of the bullet points. Specifically:

- Regarding the vapor migration issues, numerous locations, including locations to the south and southeast of the landfill, at which methane was detected are indicated in Figure 1 of Bayer's comment package. A number of the sampling locations exhibited levels greater than 25 percent methane....a level which poses a risk of explosion and fire. EPA is also concerned by the strong smell of hydrogen sulfide that is emitting from the southeast corner of the landfill in the ambient air. Carbon disulfide was detected in the soil gas samples taken along John Weaver Parkway. Sample TT-56 detected carbon disulfide levels of 19,999µg/m³; ambient air concentrations in the vicinity of the sampling were not measured. Concentrations of other VOCs detected in this sample included:

- tetrachloroethene (6,000 µg/m³, 34,884µg/m³),
- trichloroethene (6,600 µg/m³, 14,000µg/m³), and
- vinyl chloride (20,000 µg/m³, 16,000µg/m³), as well as other compounds.

All these contaminant concentration levels were observed during periods of time when the ground was not frozen and preferential migration to the surface would be expected. During periods when the ground is frozen, the preferential migration pathway would be into structures. In addition, the detections of VOC in soil gas persisted in samples taken east of John Weaver Parkway and even east of the residences located adjacent to John Weaver Parkway, even though the samples were collected in April when the ground was no longer frozen and attenuation of the vapors by direct volatilization through the soil, which is predominantly sand and gravel and offers little resistance to flow, would have been expected. Indoor air sampling in residences to the south and east of the landfill under various meteorological conditions would be required to determine if volatile organic contaminants are migrating into these structures. A gas collection system would control both ambient air releases of landfill gases and migration of explosive and toxic gases into

homes and other structures which may be constructed on or adjacent to the Himco Dump Site.

- Regarding the COPC concentrations in CDA soils on residential parcels, EPA has only conducted screening sampling of the CDA soils. This soil screening has demonstrated the presence of various contaminant concentrations that exceed EPA risk levels of concern (either a cancer risk of 1×10^{-4} or a HQ of 1.0 or a lead concentration of 400mg/kg) in several locations in the CDA. These results suggest that elevated concentrations of hazardous compounds may be found anywhere in the CDA soils at any concentration. As the CDA soils have not been fully characterized, it is not possible to say that they do not pose any unacceptable risk to on-site residents, trespassers, future recreational users or workers. The CDA soils need to be fully characterized or they need to be excavated.

- Regarding the issue of MCLs in drinking water in the CDA area during the 1998-2000 sampling events, the high detection limit ($10.0 \mu\text{g/L}$) used in the 1998 groundwater sample analysis makes it impossible to know if MCLs for VCS were exceeded in this sampling event. Attenuation of contaminant concentrations cannot be determined on one sampling event alone. And further contaminant releases from the site can not be ruled out. In addition, the concentrations of sodium, which provided the basis for the installation of a municipal water supply for the area to the south of the Himco Dump Site, have not significantly decreased since that action was implemented. On-going monitoring of groundwater in the area to the south of the landfill should be undertaken.

- Regarding the comment that the residences south of the landfill do not drink groundwater and are now served by a municipal water supply, EPA has determined that the private residential wells in this area have not been abandoned and are still operational and functional. The use of these wells by present or future residents cannot be prevented or controlled. The wells in this area need to be abandoned and sealed, in accordance with the Indiana Department of Natural Resources (IDNR) requirements listed in 312 IAC 13-10-2, and restrictive covenants placed on each property to prohibit any future private well installation and future groundwater use.

- Regarding the sampling results for the eastern residential wells, data from the monitoring wells and direct-push point locations has demonstrated a potential cancer risk which exceeds a 1×10^{-4} risk level from arsenic alone and a HI of 29, which is derived from multiple contaminant exposures all of which have a HQ which exceed unity (1.0). The data collected from the individual residential wells have demonstrated the presence of two contaminants (1,2-dichloropropane and methylene chloride) at concentrations that exceed their MCLs. The total cancer risks from exposure to contaminants in residential well water exceed 1×10^{-4} at some residences and a HQ of 16.0. All contaminants considered in these risk estimates can be considered to be site-related, based on their detection in on-site or CDA monitoring wells. Of primary concern to EPA, is the fact that not all residential wells have been sampled, and it is uncertain how many residential wells presently have unacceptable concentrations of site-related contaminants or how many may have unacceptable levels in the future if any changes in the present conditions occur, such as further releases of contaminants from the site, changes in the rate or direction of the groundwater flow due to development or other circumstances, or the

installation of a new well by a resident at a different location or depth in the groundwater aquifer.

- For the above reasons, the demonstrated potential for adverse health threats to the resident populations to the south and east of the landfill, as well as to other receptor population that might engage in trespass, recreational or construction activities either on the site or in the CDA adjacent to the site, warrant remedial actions at the Himco Dump Superfund Site.

Comment Section III I, page 36, PP #2: Bayer has commented that *"Implementation of the 2003 Proposed Plan would destroy the wet and dry prairie assemblages on the site that contain more than 100 species of plants."*

EPA's Response: EPA does not agree with this comment. An ecological assessment of the Himco Dump Site has not identified the presence of high quality wetlands or prairies on the site; the calcium sulfate cover that is present over much of the site does not provide an ideal or nutrient-rich subsurface for plant growth, especially in areas where this material is many feet deep. It is also doubtful that the area could provide high quality habitat areas, given the releases of toxic landfill gases and the presence of pharmaceutical chemicals and debris which can be seen covering the soil surface in many areas. Such material is likely to be likely toxic to animal life of any form.

Comment Section III I, page 36, PP #3: Bayer has commented that *"This habitat loss would be long-term, because a period of 30 or more years would be required to re-establish the prairie plant communities to their current conditions, and might be permanent if artificial seeding is successful."*

EPA's Response: EPA does not agree with this comment. EPA believes that the site could in fact become a high quality prairie and wetlands area, which would provide high quality habitats for birds, rodents and other animals, if that was the desired land-use for the Himco Dump Site. EPA has seen the development of the Midewin National Tall Grass Prairie on the former Joliet Army Arsenal Site, near EPA Region 5 office. Such restoration activities at the Himco Dump Site could provide higher quality areas for recreational use and community involvement than is now present at the site. The site has no aesthetic or beneficial use to either the City of Elkhart or the surrounding communities in its present condition.

Comment Section III I, page 36, PP #4: Bayer has commented that the 2003 Proposed Plan *"would entail a substantial volume of truck traffic in Elkhart to transport materials to construct the compacted clay cover and remove debris....."* and that *"The 'No Action' alternative would not incur these physical and chemical hazards..."*

EPA's Response: EPA does not agree with this comment. EPA recognizes that this comment could apply to every hazardous waste site at which a remedial, or even a removal action is proposed. However, EPA considers that the short-term hazards and exposures which might be incurred during the remedial activities described must be weighed against the long-term (virtually forever) potential for risk proposed by exposures to residents, trespassers, utility workers and others who might come in contact with contamination on the site or migrating from the site, which

are much greater in magnitude. In addition, because of the increased traffic, noise and other hazards which are currently present due to the development of the Elkhart Aeroplex Business Park just to the north of the site, it is doubtful that any increases to the present level of traffic and noise would be noticed.

Comment Section III J, pages 38-43, Implications #1-19: Bayer has included a table of 19 Fact/Finding entries and associated Implication(s) for Remedy Selection, and has requested that EPA acknowledge each of these 19 implications as a separate comment that warrants a response.

EPA's Response: EPA notes that all of the salient comments in the "Implications" table have been addressed in detail in the EPA Responses. However, for clarity, EPA is repeating these responses again in this section.

ID #	Implication(s) for Remedy Selection	EPA's Response: EPA does not agree with any of these Implications for the reasons stated below.
1	The lower permeability of calcium sulfate limits the infiltration of precipitation into the landfill to form leachate.	EPA has noted highly elevated concentrations of calcium in the monitoring well samples and in the samples taken from private residential well samples in the area to the east of the landfill. Calcium levels as high as 205,000 µg/L were detected in some residential wells; this level greatly exceeds the recommendations for calcium intake (60,000 µg/day) for infants under the age of one year, based on an upper-bound child intake of 1.0 Liter per day of this water used in preparation of formula, beverages and foods. Both the detections of high concentrations of carbon disulfide in soil gas samples in some areas and the detections of high levels of calcium in residential well water suggest that the calcium sulfate cap is now undergoing deterioration and no longer provides adequate retention of infiltration.

<p>2</p>	<p>The low permeability of calcium sulfate limits the migration of the leachate horizontally and vertically.</p> <p>The predominance of calcium sulfate in the landfill also limits the potential for formation of methane in the landfill.</p>	<p>The first comment is addressed above.</p> <p>EPA does not agree that the predominance of calcium sulfate limits the potential for formation of methane and other volatile gases, such as the more toxic hydrogen sulfide and other VOCs, produced in the landfill. Figure 1 of Bayer's comment package notes those sampling locations, including locations to the south and southeast of the landfill, at which methane was detected; a number of the sampling locations exhibited levels greater than 25% methane. However, of perhaps greater concern is the strong smell of hydrogen sulfide that is emitting from the southeast corner of the landfill. Carbon disulfide was detected in the soil gas samples taken along John Weaver Parkway. Sample TT-56 showed carbon disulfide levels of 19,999 $\mu\text{g}/\text{m}^3$; ambient air concentrations in the vicinity of the sampling were not measured. Concentrations of other volatile organic compounds (VOCs) detected in this sample included: tetrachloroethene (6,000 $\mu\text{g}/\text{m}^3$, 34,884 $\mu\text{g}/\text{m}^3$), trichloroethene (6,600 $\mu\text{g}/\text{m}^3$, 14,000 $\mu\text{g}/\text{m}^3$), and vinyl chloride (20,000 $\mu\text{g}/\text{m}^3$, 16,000 $\mu\text{g}/\text{m}^3$), as well as other compounds. Detections of VOC in soil gas persisted in samples taken east of John Weaver Parkway, even though the samples were collected in April when the ground was no longer frozen and attenuation of the vapors by direct volatilization through the soil would have been expected.</p> <p>In addition, a new and previous unrealized hazard has been identified in connection with the disposal of products containing calcium sulfate in landfills. In a recent investigation of another landfill in Ohio, it was determined that the calcium sulfate has undergone anaerobic degradation to hydrogen sulfide, a toxic gas that is migrating offsite into nearby residential homes. The breakdown of hydrated calcium sulfate in landfills has been studied by Timothy Townsend et al. of the Florida Center for Solid and Hazardous Waste Management; their report <i>Gypsum Drywall Impact on Odor Production at Landfills: Science and Control Strategies</i> is included as an attachment to this Responsiveness Summary. This recent discovery now presents yet a further potential for harm to human health for residents living adjacently to the Himco Superfund Site. Neither the indoor air samples collected in homes to the south of the Himco landfill nor the soil gas samples collected more recently were analyzed for hydrogen sulfide <u>as a site contaminant</u>.</p>
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3	<p>Implementation of either the 1993 ROD remedy or the 2003 Proposed Plan would destroy the wet and dry prairie assemblages that have developed on the landfill over the 30 years. This habitat loss would be long-term and might be permanent.</p>	<p>An ecological assessment of the Himco Dump Site has not identified the presence of high quality wetlands or prairies on the site; the calcium sulfate cover that is present over much of the site does not provide an ideal or nutrient-rich subsurface for plant growth, especially in areas where this material is many feet deep. It is also doubtful that the area could provide high quality habitat areas, given the releases of toxic landfill gases and the presence of pharmaceutical chemicals and debris which can be seen covering the soil surface in many areas. Such materials are likely to be likely toxic to animal life of any form.</p> <p>In addition, EPA believes that the site could in fact become a high quality prairie and wetland's area, which would provide high quality habitats for birds, rodents and other animals, if that was the desired land-use for the Himco Dump Site. EPA has seen the development of the Midewin National Tall Grass Prairie on the former Joliet Army Arsenal Site, near to the EPA Region 5 office. Such restoration activities at the Himco Dump Site could provide higher quality areas for recreational use and community involvement than is now present at the site. The site has no aesthetic or beneficial use to either the City of Elkhart or the surrounding communities in its present condition.</p>
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4	<p>Declines in the concentration of dissolved bromide in ground water samples demonstrate that ground water quality conditions are improving and the down-gradient impact of the Himco landfill is diminishing naturally.</p>	<p>Several potential migration pathways are present for all contaminants to migrate from the landfill to off-site locations. The primary pathways for off-site migration that were investigated in the SSI/SCR were ground water and soil gas. The soil gas detected a large number of volatile organic compounds. The contaminants detected in the ground water tend to be many of the same ones detected in the soil gas, mainly volatile organic compounds, although metals have also been detected in the ground water.</p> <p>Ground water provides the primary pathway for contaminant migration from the landfill. The fate and migration of contaminants are dependent on the interrelationship between the site-specific geological and chemical conditions, and the physical and chemical properties of the contaminant. To evaluate the potential transport and attenuation mechanisms of the contaminants emanating from the landfill in ground water, a temporal analysis of bromide levels was initially performed as described in the SSI/SCR. One conclusion from this trend analysis is that the bromide source is still actively recharging ground water, but a gradual decrease of bromide levels may be seen in lower levels of the aquifer. Attempts were also made to evaluate the trends of organic contaminant levels, but no discernable pattern was found in the SSI/SCR. When compared to the bromide trends, the changes in organic contaminant levels are much more sudden, indicating other potential transport and/or attenuation mechanisms are present than those mechanisms impacting the movement of the conservative bromide ion.</p> <p>The EPA believes that based on all available analytical data that contaminants continue to move vertically from the landfill, and partition between the air and water phases based on their chemical properties. Those contaminants that are soluble will move with water, those that are volatile will move in the soil gas, those that are both move in both phases. The transport/attenuation mechanisms vary based on the contaminants. Given the heterogeneous nature of the landfill and differences in transport/attenuation mechanisms between bromide, organic contaminants, and even other inorganic contaminants, it is not reasonable to use bromide concentrations alone as an indicator of ground water quality, and the use of bromide trends as an indicator of other contaminant trends is not acceptable.</p>
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5	<p>The BRA demonstrated that ground water quality south of the landfill could not be improved by any remedial action taken regarding the landfill to a level that would meet EPA's acceptable risk range, because up-gradient ground water quality exceeded the acceptable cancer risk range.</p>	<p>EPA has repeatedly sampled the ground water in the area south of the Himco Dump site since the BRA, and has included an updated risk assessment in the SSI/SCR. EPA responded in the Appendix C, Section V. A., response that metallic contaminants found in the shallow CDA wells used to characterize risks from ground water use to present or future residents in the CDA <u>cannot</u> be dismissed as background contamination. Background levels of metals in the area of the Himco Dump Site have been demonstrated, using site monitoring wells, to be extremely low, and the metal concentrations in the CDA monitoring wells greatly exceed these background levels.</p> <p>EPA's risk assessment for exposure to carcinogenic and non carcinogenic contaminants in the CDA monitoring wells in the area downgradient of the former dump removal, where ground water contaminants have been found to be elevated, is based on all data from the 1995 to 2000 sampling of wells WT166A and WT119A which met the stringent requirements for use in a quantitative risk assessment. Comparison with risk-based screening values and appropriate comparisons with upgradient site background wells, which represent background levels in the immediate vicinity of the Himco Dump Site, were used to develop the list of contaminants of potential concern (COPCs) for the risk assessment</p> <p>Based on oral exposure to arsenic, BEHP, carbazole, benzene, 1,2-dichloropropane and vinyl chloride. The lifetime cancer risk, <u>based on ingestion of CDA ground water alone</u>, was determined to be 1.75×10^{-4}. Thus, the cancer risk from oral exposure alone demonstrates an unacceptable risk. In addition, the cancer risks for inhalation exposure for some contaminants can be expected to exceed their respective oral risks because some of the compounds are very volatile compounds with high inhalation toxicity (e.g., benzene, 1,2-dichloropropane).</p> <p>The non cancer risk to groundwater is based on exposure to antimony, arsenic, iron, manganese, thallium, BEHP, carbazole, benzene, 1,2-dichloropropane, and vinyl chloride. The non cancer risk, based on ingestion of CDA ground water alone, was determined to result in a total Hazard Index of 18.73, which greatly exceeds unity (1.0). Thus, the non cancer risk <u>from oral exposure alone</u> demonstrates an unacceptable risk level. And the non cancer Hazard Quotients for inhalation exposure for some contaminants can be expected to exceed their respective oral Hazard Quotients because some of the compounds are very volatile compounds with high inhalation toxicity (e.g., benzene, 1,2-dichloropropane). In addition, the extremely high levels of calcium and sodium found in the CDA ground water constitutes an immediate risk to some population who may be exposed to this water.</p> <p>EPA believes that the SSI/SCR risk assessment and the cancer and non cancer risk estimates developed for potential exposure to CDA ground water demonstrate an unacceptable risk level and a requirement to cap the remaining residential wells in this area and to institute restrictions on future use of ground water in this area in order to insure continuing protection of health for the present and future residents of the area.</p>
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6	<p>There is no evidence that ground water underneath the landfill flows to the east or toward Elkhart's N. Main Street well field.</p>	<p>The RI Report characterizes the hydrogeology and groundwater flow at two different scales, from a regional standpoint, and from a much smaller site-specific standpoint. A regional hydrologic study was performed by the USGS between 1978 and 1981, the results which were incorporated into the RI Report. This regional hydrologic study encompassed an area of approximately 120 square miles. A regional contour map of groundwater flow in the unconfined aquifer from the USGS study was presented in the RI Report, showing flow is generally to the south toward the St. Joseph River. The USGS did not differentiate between water levels obtained from monitoring wells screened across the water table or at depth within the unconfined aquifer as was performed in the SSI/SCR. Given the scale of the USGS investigation, this would probably not have made much difference in the interpreted ground water flow direction as presented. The RI and the SSI/SCR present groundwater flow interpretations based on a network of monitoring wells from a much smaller area of approximately one square mile. Furthermore, the interpreted ground water flow directions' presented in the SSI/SCR were segregated by depth of the screen interval of the monitoring wells based on the fact that vertical gradients were noted in many of the nested monitoring well clusters. Even when comparing results from vastly different scales and monitoring networks, one can see that the site-specific results closely match those presented in the regional study for the area immediately surrounding the Himco Dump Site. All studies show that there is a south to southeast ground water flow direction around and beneath the Himco Dump Site. This implies that on a local basis (on the east side of the Himco Dump Site), there is an easterly component, albeit small, to the ground water flow direction. The EPA has never maintained that ground water flows strictly in an eastward fashion.</p> <p>Furthermore, Bayer has inferred that the shape of the bromide contours may be used as an indication of ground water flow direction. A comparison of Figures 9 and 10 of the U.S. Geological Survey Water-Resources Investigations Report 91-4053, which shows the areal distributions of maximum dissolved bromide concentrations for 1980 and 1982 respectively, clearly shows dissolved bromide migrating toward the east to what is identified as an area of industrial pumping (the Bayer Corporation). This is clear evidence that an eastward component of ground water flow has existed in the vicinity of the Himco Dump Site.</p>
7	<p>In 1988 the Himco landfill was proposed for the NPL on the basis of an inflated HRS score.</p> <p>There is no evidence that ground water underneath the landfill flows to the east or toward Elkhart's N. Main well field.</p>	<p>The 1992 RI and 2003 SSI/SCR have demonstrated that residential wells to both the south and east of the Himco Dump Site have been adversely impacted by the landfill.</p> <p>The response to the second comment is the same as above.</p>

8	<p>Had the Himco site been re-scored in December 1990, taking into account that residences and businesses south of Himco are served by the municipal water, the Himco landfill would have scored less than 28.5, making it ineligible for the NPL.</p>	<p>In 1990, when the Himco Dump Site was placed on the NPL, residences located to the south of the landfill had been placed on municipal water because the site investigations had determined that the sodium levels in their water greatly exceeded all health-based recommendations. Seventy-seven drums containing hazardous chemicals had been located and removed from the site. Since then the presence of several contaminants (e.g., benzene, 1,2-dichloropropane and methylene chloride) at concentrations that exceed their respective MCLs have been detected in monitoring wells and private residential wells.</p> <p>However, if the site were to be re-scored based on the finding of the sampling for the SSI/SCR, the site would surely qualify for the NPL. The presence of elevated sodium levels, as well as numerous volatile organic compounds, in residential wells to the east of the landfill have since been documented; some exceed their MCL levels. In addition, the detection of volatile gas plumes migrating from the landfill toward nearby residence would also trigger a further investigation of the site. And levels of gases which exceed their lower explosive limits (LELs) have also been detected in samples taken during volatile gas sampling rounds.</p>
9	<p>Sites that pose no significant risk to public health and the environment should be deleted from the NPL. EPA has deleted numerous such sites from the NPL after completion of the RI.</p>	<p>Elevated cancer and non-cancer risks, which exceed EPA's acceptable risk range, from contaminants in ground water and the CDA soil have been demonstrated at the Himco Dump NPL Site.</p> <p>In addition, toxic and explosive gases have been shown to be migrating from the landfill toward the nearby residences. Given the data from the supplemental site investigations, remedial action is warranted at the landfill.</p>

<p>10</p>	<p>In the RI, the hypothetical future risk is based upon use of landfill leachate as a source of drinking water. In a public meeting in Elkhart, Indiana, EPA acknowledged that leachate consumption was an unrealistic exposure scenario.</p> <p>Given site-specific factors and common sense. The only reasonable conclusion is that human consumption of landfill leachate for drinking water is "extremely unlikely" and that the site poses no health risk under any reasonable exposure and release scenario.</p>	<p>The Fact/Finding raised several issues, which are addressed below:</p> <p>(a) The 1992 assessment demonstrated that the ground water underlying the landfill site was contaminated, and that it presented a potential risk to future residents should such development occur. As discussed in Chapter 1.0 of the SSI/SCR, sampling conducted since the completion of the 1992 RI has documented the presence of higher levels of site contaminants in ground water. During the course of the 1995 Pre-Design Field Investigation, construction debris was encountered in borings for monitoring wells WT116A and WT116B. The SSI/SCR notes that <i>"Ground water samples from monitoring well WT116A yielded detects of numerous previously unreported SVOC's, and benzene at 15 micrograms per liter (µg/L), which is above the Maximum Contaminant Level (MCL) of five µg/L. These data suggest that portions or all of the CDA may contain higher levels of contamination than previously recognized in the RI/FS."</i> It is expected that at on-site locations, where waste remains in contact with ground water, contaminant concentrations are higher than detected in the downgradient wells south of the landfill.</p> <p>(b) At the time the 1992 baseline risk assessment was conducted, residential, agricultural, and industrial uses were all considered possible although their likelihood differs. The possibility of each of these land uses is based on factors including surrounding land use in the area, historical uses of the land (portions of the site were once agricultural) and developmental feasibility. Additionally, the assessment provided qualitative information on the likelihood of a future land use actually occurring. For example, the Himco site risk assessment clearly stated that there is a low probability of a future residential land use (at least on the landfilled area), there is some likelihood of the site returning to agricultural uses, and there is some probability that the site would be developed for recreational use and indeed development of a golf course was seriously discussed in the very recent past. However, residential and commercial development of properties that were previously used as dump sites is not unusual, and this kind of development occurred frequently in the very recent past. Since there is some likelihood of some kind of future use for land that is situated in close proximity to the City of Elkhart, and since construction of housing and industrial development has taken place on other landfill sites, it is appropriate for the risk assessment to evaluate future exposures and for risk management decisions to take this information into account in making sites remedial decisions. This type of analysis is useful to all parties, both the PRPs and EPA risk manager, because it allows the selection of remedial actions on the necessary and anticipated future actions for the site.</p> <p>(c) Bayer has <u>grossly misinterpreted</u> the comments of the EPA Project Manager (Gwen Massenburg) at the April 23, 2003 public meeting in Elkhart, Indiana. The quotations provided by Bayer in footnote 154 indicate that Ms. Massenburg actually said that <i>".....we had a scenario where we said that people were actually living on the landfill and drinking water from the landfill. That would never happen.....We realize that people would never live on the landfill and they would never drink the water beneath the landfill."</i> Ms. Massenburg's was addressing concerns raised by the public over the risk estimates in the SSI/SCR from inhalation and consumption of</p>
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10 continued		contaminants detected in ground water south of the site. Her comments reflect EPA's intent to place future land use restrictions on the use of ground water both on-site and in off-site areas where contaminants have been detected in ground water, through the capping of existing wells and the prohibition of installation of new wells in these areas, so that this hypothetical scenario cannot in fact be realized in the future.
11	The 1993 ROD remedy included construction and maintenance of a composite cap, installation of an active landfill gas collection and treatment system and other measures. The ROD is arbitrary and capricious, because EPA failed to recognize that the site did not pose any unacceptable risk under a reasonable exposure and release scenario.	That the 1993 ROD contained components, such as a composite cap, that may have minimal effectiveness does not suggest that a "no action" alternative, suggested by Bayer, is appropriate for the site. A more complete evaluation of the site has taken place, in response to the 1993 ROD. The additional data collection and analysis described in the SSI/SCR have documented the presence of elevated sodium levels, as well as the presence of volatile organic compounds, in residential wells to the east of the landfill. The concentrations of some contaminants exceed their MCLs for drinking water use. The detection of volatile gas plumes migrating from the landfill toward nearby residences, as well as the detection of some explosive gases at levels which exceed their lower explosive limits (LELs) in samples taken during volatile gas sampling rounds provide firm support for the need for an active landfill gas collection and treatment system. Although indoor air monitoring for vapor migration from the landfill has not been conducted, the data suggests that volatile contaminants are migrating into residences. Sampling of CDA soils has demonstrated that contaminant levels that may exceed acceptable health risk levels are likely to be located anywhere in this area.

12	<p>EPA also produced no data or analysis in the SSI/SCR or the 2003 Proposed Plan document to demonstrate that the compacted clay cover would not also require acquisition of residential properties to facilitate vehicle access, fencing, right-of-way requirements, and storm water management structures.</p>	<p>Real estate requirements are based upon a defined remedy and are design dependents. Until the design is completed, impacts to residential properties cannot be assessed.</p>
13	<p>From September 1998 through November 2000, ground water was sampled from selected wells bear the Himco landfill on three occasions. The results document that the MCL has not been exceeded recently (1998-2000) for any constituent in ground water from the CDA.</p> <p>Under EPA's own Superfund guidelines, ground water south of the landfill does not warrant remedial action under CERCLA.</p> <p>Ground water south of the landfill currently meets MCLs.</p>	<p>During the 1998 ground water sampling events a high detection limit (10 µg/L) was used in the sample analysis making it impossible to know if MCLs for volatile organic contaminants were exceeded in this sampling event. Attenuation of contaminant concentrations and compliance with drinking water MCLs cannot be based on a single sampling round in 2000. Most volatile organic contaminants of interest in drinking water have MCLs well below 10 µg/L, with some (e.g., vinyl chloride and benzo(a)pyrene) having MCLs at 2 µg/L and 0.2 µg/L, respectively; thus, it is unlikely that these would have been detected in the 1998 and earlier sampling events. In addition, the four sampling rounds in WT116A and two sampling rounds in WT119A were taken at different times of the year. Seasonal variations in contaminant concentrations have been demonstrated in ground water at other Superfund Sites (e.g., the Roy Blackwell Forest Preserve 1 landfill, Du Page County, Illinois) when quarterly data were available. Contaminant concentrations that exceeded MCL values (benzene; Sept. 1995, Nov. 1996, Nov. 2000) have been detected in some samples taken from well WT116A, suggesting that contaminant levels in ground water at the Himco site may exhibit seasonal variation as well. However, for the reasons stated above, no time trends in contaminant concentrations can be projected from these data. Periodic monitoring of site wells will be required to determine whether significant elevation in contaminant levels are indeed occurring at this site or site contaminant levels are attenuating. Residual residential wells located down-gradient of the Himco Dump should be capped to prevent their use during this period of time.</p>

14	<p>The EPA's health risk assessment in the SSI/SCR demonstrates that COPC concentrations in CDA soils on residential parcels do not pose any unacceptable health risk to on-site residents and do no warrant remedial action under CERCLA.</p>	<p>EPA again notes that Bayer's has focused on parcels that are currently used for residential land uses only. EPA has evaluated the cancer risks for a combined child/adult resident and for a construction worker and the non-cancer risks (HIs) for a child resident and for a construction worker at all land parcels, both residential and undeveloped commercial/industrial parcels, consist with standard risk assessment assumptions for such a site. EPA has also stated that there is nothing that renders it unlikely that future homes or high-density housing may be built on the site south of the landfill in the future. There are currently homes along County Road 10 south of the landfill. The contaminated area between County Road 10 and the landfill, including the area known as the construction debris area (CDA) is obviously a location where future housing might be constructed. Because no agreement could be reached as to the future use of any parcels, residential or nonresidential, and because the options are infinite, EPA chose to evaluate the CDA soils for a future residential land use, with the expectation that <u>any</u> future development of <u>any</u> land parcels would require a use-specific risk assessment. Since there is a likelihood of some kind of future use for land that is situated in close proximity to the City of Elkhart, and since construction of housing and industrial development has taken place on other landfill sites, it is appropriate for the risk assessment to evaluate such exposures using a future land use scenario and for risk management decisions to take this information into account in making sites remedial decisions, including land use zoning restrictions.</p> <p>EPA has previously noted that in Chapter 11 (Conclusions), the risk assessment states <i>"Soil samples collected from the Construction Debris Area demonstrate the presence of polynuclear aromatic hydrocarbons (PAHs) and the metals aluminum, antimony, arsenic, copper, manganese, mercury, lead and nickel at concentrations that may be associated with CDA dumping activities. The volatile organic compounds 1,1-dichloroethane, benzene, ethylbenzene, and xylene were detected in one sample with no other site related volatile organic compounds reported."</i> In addition, lead was detected above the residential screening level in land parcel F in one surface soil sample at an estimated concentration of 695 mg/kg. Lead was also detected in other surface, near surface and subsurface soil samples at land parcels F, D, S and O (no soil samples were collected at Land Parcel N, R, Q and T). Although the concentrations detected were below the screening level, the concentrations represent lead concentrations in unsieved samples. It has been determined that lead concentrations in soil generally increase with decreasing particle size; concentration factors of 1.4 and greater for the fine fraction of soil that most readily sticks to children's hands (the ingestible fraction as determined by sieving of the soil) have been reported at Superfund sites. Therefore, use of the total soil concentrations likely underestimates the overall children's health risk to lead in the identified parcels. When all receptor populations are considered, the cancer risk to the resident from exposure to CDA soil in all parcels was estimated to range from 1.9×10^{-5} (in <u>un-sampled</u> parcel N) to 1.5×10^{-4}, with the risk at or exceeding 10^{-4} in two parcels (F and S). The cancer risk range for a construction worker from exposure to CDA soils was $> 10^{-6}$ to 4.6×10^{-6}. The non cancer risk (HI) to the residential child due to exposure</p>
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<p>14 continued</p>		<p>to CDA soil was estimated to range from 0.11 (in <u>un-sampled</u> parcel N) to 4.5 (in parcel F due to arsenic and benzo(a)pyrene). The non-cancer risk (HI) to a construction worker in parcel F was estimated at 1.3. Thus it is clear that both cancer and non-cancer estimated risks exceed an unacceptable risk level in some parcels in the CDA.</p> <p>Also, as previously stated, the CDA sampling was conducted as a screening exercise. Soil sampling of the parcels was sparse and not all land parcels, either residential or commercial, was sampled, so there is great uncertainty as to whether these estimates are inclusive of all CDA soil constituents or are representing the maximum risks that might be expected from exposure to the CDA soils. Because the CDA soils have not been fully characterized, it is highly likely that not all CDA soil contaminants were identified nor were the highest contaminant concentrations determined. EPA notes that in support of this comment, Bayer has included foot167: "See SSI/SCR, Tables 9-11 (Parcel M), 9-12 (Parcel O), Table 13, (Parcel N), Table 9-14 (Parcel P), and 9-16 (Parcel T) and page 9-52; Nonresidential parcels O (see Table 9-17), R (see Table 9-17), and D (see Table 9-20) also met these no-risk criteria." As has been clearly stated in the SSI/SCR and in earlier responses by EPA on this issue, soil samples were obtained from parcels D, F, M, O, P and S only. <u>No soil samples were collected from land parcels N, O, R, and T.</u> The risks were projected for these parcels, based on <u>geostatistical modeling of two contaminants only</u>, arsenic and benzo(a)pyrene, and thus are highly uncertain. Thus, risks in these parcels are most likely underestimated. However, it was never the intention to fully characterize the CDA soils in these screening samples, and EPA has noted that Bayer had previously submitted a Work Plan for the sampling of the CDA for the purpose of determining if the soil contained any constituents that present a risk to human health. EPA completed this task, and the screening sampling has demonstrated a potential for concern for exposure to CDA soils.</p> <p>Perhaps the most important conclusion from the screening sampling is that <u>contaminants may be present anywhere in the CDA soils at concentrations that could exceed risk levels.</u> A final conclusion of the CDA analysis, as stated in Chapter 11 of the SSI/SCR, is that "<i>CDA soils have demonstrated a potential risk from repeated exposure and should be removed.</i>"</p>
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15	<p>The spatial pattern of the soil gas sampling demonstrates that VOC concentrations in soil decrease (attenuate) readily with distance from the landfill and generally are not detectable near and underneath the residences. In only a few locations near the landfill did concentrations exceed levels that would pose an unacceptable risk for ambient air and no such locations were near or underneath residences.</p> <p>Vapor migration, if any, does not pose unacceptable risks to residents near the Himco landfill; therefore, VOCs in soil gas do not warrant remedial action under CERCLA.</p>	<p>EPA agrees that the soil gas sampling demonstrates that VOC concentrations are associated with releases from the landfill, as is shown by the decreases in contaminant concentrations with distance from the landfill. EPA believes that the results of the soil gas sampling events demonstrate that methane, hydrogen sulfide and other VOCs are migrating from the landfill toward off-site residences to the south and east, and that the installation of an active landfill gas collection system will be required to control the migration of toxic and explosive gases that are presently migrating from the site for the reasons that follow:</p> <p>(a) It appears that Bayer did not understand the purpose of the soil gas sampling or how such results are to be used, although Bayer did submit a Work Plan for this sampling in 1998. The Draft Work Plan for Supplemental Site Characterization and Access Controls at the Himco Landfill NPL Site, Elkhart, Indiana, prepared and submitted to EPA by QST Environmental at the request of the Himco PRP Group on January 6, 1998, presented a sampling strategy for such sampling. The Bayer/PRP group never initiated this sampling, and EPA undertook this task, following the sampling scheme proposed in the Bayer/PRP Group Work Plan.</p> <p>Regarding the soil gas sample results, EPA notes that the Bayer/PRP Group Work Plan stated: " Previous investigations to characterize soil gas constituents generated from the landfill have focused on the area within the boundaries of the landfill (Donahue, 1992; Quadrel, 1995). The purpose of this soil gas survey at the Himco Dump Site is to determine whether landfill generated constituents in the soil gas are migrating horizontally away from the landfill to the south and east, where residences are located, and to quantify the levels of those constituents which are migrating." "Initially, 15 locations will be sampled along the southern and eastern boundary of the landfill (Figure 2). These initial points will be located approximately 50 feet from the landfill boundary and at approximately 200-foot intervals. Constituents to be sampled include methane, hydrogen sulfide, and non-methane volatile organic compounds. Where the concentration of methane is detected at concentrations equal to or greater than 25% of the lower explosive limit (LEL) at an initial sampling location, then two additional locations will be sampled stepping away from the landfill boundary in order to evaluate the attenuation of the detected constituent(s). Each secondary location will be approximately 70 feet in a direction of 45 degrees either side of the initial sampling location such that the three locations form a triangle. With this sampling configuration, the secondary sampling points will fall on a line parallel to but 50 feet farther away from the landfill boundary. The secondary locations will also be sampled for methane, hydrogen sulfide, and non-methane volatile organic compounds."</p> <p>The initial round of soil gas sampling conducted by EPA unexpectedly detected methane and VOCs in soil gas at highly elevated concentrations. The sampling was thus continued, in the stepwise manner described, during several distinct sampling events, until the VOC and methane concentrations in the soil gas samples were no longer detectable. Thus, the results at all sampling locations on the outer perimeter of the sampled area would, <u>by design</u>, yield undetectable levels of methane or other VOCs.</p>
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(b) The soil gas sampling was conducted in accordance with a decision made at a meeting at the Bayer facilities in which both Bayer and EPA agreed that the collection of soil gas samples would provide adequate documentation of a vapor migration pathway and that the collection of indoor air samples in homes would not be desirable or required for future decision-making at the site. At no time was it ever considered that the soil gas samples would be used to evaluate risks in ambient air. As previously stated, because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations in homes, the sampling points were not located near (within 10 feet) or underneath the residences. The 2002 EPA OSWER Draft Guidance for Evaluating Vapor Intrusion to the Indoor Air Pathway From Groundwater and Soils uses a three-tiered approach for assessing the vapor intrusion pathway, including primary and secondary screening of a site followed by a site-specific pathway assessment. The initial screening is based on the presence of contaminants in soil gas or ground water within 100 ft of a building designed for human occupancy. The document also discusses the potential for mobile "vapor clouds" (gas plumes) which are caused by methane carrier gas in the vicinity of landfills, and which have been known to travel 100s of feet in distant from the landfill site.

The Phase I and Phase II soil gas sampling conducted in areas both south and east of the Himco Dump site clearly shows that contaminants have been found in soil gas within 100 ft of residential structures. The concentration of volatile contaminants detected in these soil gas samples suggests the potential for an intact vapor intrusion pathway. Sampling in the area to the east of the site has detected contaminants in soil gas samples taken in public areas (parkways) both west (between the landfill and the residential structures) and east of the structures, suggesting the homes are positioned to naturally intercept this vapor movement during periods when the ground is frozen and escape of volatile gases to ambient air is blocked.

Because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations the data were not considered by EPA to be suitable for modeling volatile gas concentrations in indoor air. Therefore, the data were not used quantitatively to estimate risks to indoor air exposure. However, a qualitative discussion of the soil gas sampling results is presented in Chapter 5 of the SSI/SCR. Figures 5-1 through 5-4 present the contoured concentration data for the compound classes BTEX (benzene, toluene, ethyl benzene and xylene), chlorinated ethenes, chlorinated ethanes and vinyl chloride. All of the listed compound classes, as well as carbon disulfide, were found along the entire length of the southern off-site area of the landfill where sampling was performed. In one location south of the landfill, in the CDA, hydrogen sulfide levels were so great that the instrument detector was affected and sampling had to be halted.

16	<p>Various lines of evidence, including three lines hydrogeologic investigations suggest that the Himco landfill is not the source of VOCs detected in certain residential wells east of the landfill.</p> <p>The EPA has not established that the detected VOC concentrations pose unacceptable risks to any residents.</p>	<p>The RI Report characterizes the hydrogeology and groundwater flow at two different scales, from a regional standpoint, and from a much smaller site-specific standpoint. A regional hydrologic study was performed by the USGS between 1978 and 1981, the results which were incorporated into the RI Report. This regional hydrologic study encompassed an area of approximately 120 square miles. A regional contour map of groundwater flow in the unconfined aquifer from the USGS study was presented in the RI Report, showing flow is generally to the south toward the St. Joseph River. The USGS did not differentiate between water levels obtained from monitoring wells screened across the water table or at depth within the unconfined aquifer as was performed in the SSI/SCR. Given the scale of the USGS investigation, this would probably not have made much difference in the interpreted ground water flow direction as presented. The RI and the SSI/SCR present groundwater flow interpretations based on a network of monitoring wells from a much smaller area of approximately one square mile. Furthermore, the interpreted ground water flow directions' presented in the SSI/SCR were segregated by depth of the screen interval of the monitoring wells based on the fact that vertical gradients were noted in many of the nested monitoring well clusters. Even when comparing results from vastly different scales and monitoring networks, one can see that the site-specific results closely match those presented in the regional study for the area immediately surrounding the Himco Dump Site. All studies show that there is a south to southeast ground water flow direction around and beneath the Himco Dump Site. This implies that on a local basis (on the east side of the Himco Dump Site), there is an easterly component, albeit small, to the ground water flow direction. The EPA has never maintained that ground water flows strictly in an eastward fashion.</p> <p>Furthermore, Bayer has inferred that the shape of the bromide contours may be used as an indication of ground water flow direction. A comparison of Figures 9 and 10 of the U.S. Geological Survey Water-Resources Investigations Report 91-4053, which shows the areal distributions of maximum dissolved bromide concentrations for 1980 and 1982 respectively, clearly shows dissolved bromide migrating toward the east to what is identified as an area of industrial pumping (the Bayer Corporation). This is clear evidence that an eastward component of ground water flow has existed in the vicinity of the Himco Dump Site.</p>
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17	<p>Regarding the issue of constructing and maintaining a compacted clay barrier and soil cover over the entire footprint of the landfill, installing and operating an active gas collection and treatment system, and other measures, the 2003 Proposed Plan is arbitrary and capricious, because EPA failed to recognize that the site did not pose any unacceptable risk under a reasonable exposure and release scenario.</p> <p>The 2003 Proposed Plan is not more protective of human health than the "No Action" alternative and is, therefore, not cost effective.</p>	<p>The aerial extent and thickness of the existing landfill cover materials varies and was not placed with according to an engineered design with specifications and quality control. The soil cover in the proposed plan is intended to prevent dermal contact with the waste. The components of the soil cover is based upon ARAR's being IDEM remedial requirements for Open Dumps.</p>
18	<p>Given that the composite cap will have "minimal" effectiveness, the proposed clay cap, which is not as thick as the composite cap and does not incorporate the internal drainage features of a composite, will have "less-than-minimal" effectiveness and the 2003 Proposed Plan is also "not cost effective."</p>	<p>As stated, in the response above (17), the components of the soil cover is based upon ARAR's being IDEM closure requirements for Open Dumps. A site-specific analysis would be required to develop a cover type and thickness that could be constructed that would prevent dermal contact with the waste. Specific items that would have to be addressed include the following design related issues: Topsoil and rooting depth of cover soil that would be required to sustain vegetation. Material availability. Temporary and permanent erosion control requirements. Demarcation warning and separation barrier materials required to prevent erosion, biotic and human intrusion into the waste. Constructibility issues relating to material selection and equipment compatibility.</p>
19	<p>The 2003 Proposed Plan does not mention the physical and chemical hazards to nearby residents that will be created by implementing the 2003 Proposed Plan.</p> <p>The "No Action" alternative will not incur these physical and chemical hazards and so is more protective of human health than the 2003 Proposed Plan.</p>	<p>EPA recognizes that this concern could apply to every hazardous waste site at which a remedial, or even a removal, action is proposed. However, EPA considers that the short-term hazards and exposures which might be incurred during the remedial activities described must be weighed against the long-term (virtually forever) potential for risk proposed by exposures to residents, trespassers, utility workers and others who might come in contact with contamination on the site or migrating from the site, which are much greater in magnitude. In addition, because of the increased traffic, noise and other hazards which are currently present due to the development of the Elkhart Aeroplex Business Park just to the north of the site, it is doubtful that any increases to the present level of traffic and noise would be noticed.</p>

Comment Section IV A, page 44, ROD #1: Bayer has again commented that *"EPA has not identified any risk to human health or the environment at the Himco landfill."* Several specific comments (three bullets) are provided by Bayer in an attempt to support their position.

EPA's Response: EPA does not agree with this comment. The responses to the specific comments, presented in the three bullets, follow:

- Regarding Bayer's comments that *"residences and businesses south of the landfill are connected to the municipal water supply. Residents, therefore, are not exposed to any ground water that may be impacted by the landfill. If there is no exposure, there can be no risk. Sampling and analysis of the residential wells south of the landfill in April 1990 'indicated that contamination did not exceed enforceable levels for public drinking water,' indicating no health threat in the event that these wells were used for drinking water,"* EPA does not agree with this comment, and has previously responded that although the residences south of the landfill do not drink ground water and are now served by a municipal water supply, EPA has determined that the private residential wells in this area have not been abandoned and are still in place. The use of these wells by present or future residents cannot be prevented or controlled. The wells in this area need to be abandoned and sealed, in accordance with the Indiana Department of Natural Resources (IDNR) requirements listed in 312 IAC 13-10-2, and deed restrictions placed on each property to prohibit any future private well installation and future ground water use. In addition, although the 1990 sampling of monitoring wells did not detect the presence of any contaminants that exceeded enforceable levels in public drinking water, the January 1995 sampling and analysis in WT116A, which is located in the area down-gradient of a large on-site drum removal activity, showed the presence of benzene in ground water at 15 µg/L, a level which clearly exceeds the MCL for this compounds, as well as the presence of many other contaminants. It should be considered that the detection limits for sampling rounds prior to 2000 were extremely high (10 µg/L), a level which would not detect the exceedence of the MCL or risk-based level for many contaminants. However, the detection of benzene at this elevated concentration in 1995, indicates that releases from the landfill are both sporadic and ongoing, and that residential use of ground water in this area should be prohibited.

- Regarding Bayer's comments that *"Sampling of indoor air in residential basements south of the landfill during the RI did not show any detectable methane or hydrogen sulfide,"* and that *"These data demonstrate that the landfill does not pose a gas migration threat to residences,"* EPA does not agree with this comment. EPA has previously responded that a number of the sampling locations shown in Figure 1 of Bayer's comment package, which presents a summary of soil gas sampling results from 1995-1999, exhibited levels greater than 25% methane....a level which poses a risk of explosion and fire. EPA is also concerned by the strong smell of hydrogen sulfide that is emitting from the southeast corner of the landfill in the ambient air. Carbon disulfide was detected in the soil gas samples taken along John Weaver Parkway. Sample TT-56 showed carbon disulfide levels of 19,999 µg/m³; ambient air concentrations in the vicinity of the sampling were not measured. Concentrations of other volatile organic compounds (VOCs) detected in this sample included: tetrachloroethene (6,000 µg/m³, 34,884 µg/m³), trichloroethene (6,600 µg/m³, 14,000 µg/m³), and vinyl chloride (20,000 µg/m³, 16,000 µg/m³), as well as other compounds. All these contaminant concentration levels were observed during periods of time

when the ground was not frozen and preferential migration to the surface would be expected. During periods when the ground is frozen, the preferential migration pathway would be into structures. In addition, the detections of VOC in soil gas persisted in samples taken east of John Weaver Parkway and even east of the residences located adjacent to John Weaver Parkway, even though the samples were collected in April when the ground was no longer frozen and attenuation of the vapors by direct volatilization through the soil, which is predominantly sand and gravel and offers little resistance to flow, would have been expected. Indoor air sampling in residences to the south and east of the landfill under various meteorological conditions would be required to determine if volatile organic contaminants are migrating into these structures. A gas collection system would control both ambient air releases of landfill gases and migration of explosive and toxic gases into homes and other structures which may be constructed on or adjacent to the Himco Dump Site.

In addition, several new pieces of information available to EPA since the RI was completed. The first is the reporting in the open (peer-reviewed) literature that volatile chlorinated compounds move ahead of methane in the subsurface soil, and therefore these contaminants may be present in structures even when methane is not found. This information prompted the soil gas sampling described in the SSI/SCR. In addition, it has become apparent that the calcium sulfate cover material is degrading, a condition which may not have been detected in the pre-RI sampling. And recent studies have demonstrated that the products of degradation of hydrated calcium sulfate in landfills include both hydrogen sulfide and carbon disulfide. Regrettably, hydrogen sulfide concentrations were not measured during the supplemental soil gas sampling exercises, although the SSI/SCR does report problems with equipment failure to extremely high levels of hydrogen sulfide in some sampling locations.

- Regarding Bayer's comment that *"According to the results of the BRA, the surface soils on the landfill do not pose an unacceptable risk to trespassing dirt-bikers nor to off-site residents via dust or vapor inhalation and downwind migration,"* EPA does not agree with this comment. The data collected for on-site exposures for the BRA are now more than 10 years old. Thus, there is some uncertainty in relying on the past surface soil data for the site. EPA has observed evidence of dumping, digging, trenching and other activities which disturb surface soil over this time period. The contaminant concentrations presently in surface soil on the site may be elevated due to such activities, if subsurface soil has been brought to the surface. However, past sampling activities did not address the C.A. soils, and analysis of exposures to this area was not included in the BRA. Screening sampling conducted for the SSI/SCR has demonstrated the presence of various contaminant concentrations that exceed EPA risk levels of concern (either a cancer risk of $1 \text{E-}04$ or a HQ of 1.0 or a lead concentration of 400 mg/kg) in several locations in the CDA. These results suggest that elevated concentrations of hazardous compounds may be found anywhere in the CDA soils at any concentration. As the CDA soils have not been fully characterized, it is not possible to say that they do not pose any unacceptable risk to on-site residents, trespassers, future recreational users or workers.

- Regarding the ponds near the landfill, Bayer has commented that they *"do not pose an unacceptable health risk to recreational receptors,"* based on statements in the RI that "Overall, inorganic analyte concentrations were not significantly different from background. Beryllium and

antimony [which the RI regarded as the primary COPCs] were not detected in any surface water sample.”

Comment Section IV B, page 45, ROD #2: Bayer has commented that “*The Remedial Investigation (RI) did not provide evidence of any unacceptable adverse environmental effect that is related to the Himco landfill.*”

EPA’s Response: EPA agrees with this comment.

Comment Section IV C, page 45, ROD #3: Bayer has commented that “*Under the NCP, EPA is authorized to undertake remedial action only when an NPL site poses unacceptable health risks or environmental threats under a reasonable exposure and release scenario.*” Bayer has suggested that since EPA may consider risk estimates slightly greater than 1×10^{-4} to be protective, EPA is not authorized under the NCP to implement the 1993 ROD or the 2003 Proposed Plan.

EPA’s Response: EPA does not agree with the comment for several reasons. EPA notes that this comment addresses several different and unrelated issues. First, regarding the discussion of the upper boundary of EPA’s acceptable risk range, EPA does not consider that any value within this range can be characterized as “acceptable” without further evaluation. EPA HQ views a 10^{-6} risk level as the “point of departure” for requiring further investigation of the hazard, and the 10^{-4} risk level as the immediate action or removal trigger level. For everything in between, “it all depends”; EPA does not consider the magnitude of the risk value (the “number”) alone but also the assumptions used in the calculation and the uncertainties in the calculated value. Any value in the risk range may trigger a remedial action. And while a risk in the immediate range may or may not result in some remedial action (a risk management decision), it is clear that there is a risk that exceeds EPA’s definition of a minimal risk level (a risk assessment decision).

EPA has previously stated that in the discussion of the EPA Superfund, the concept of the point of departure must be included or the program has been significantly misrepresented:

“For example, the Federal Superfund program has established an acceptable range for lifetime excess cancer risks of $10e-4$ to $10e-6$. EPA uses the $10e-6$ level as a point of departure for corrective actions goals (called preliminary remediation goals) for cancer risks from contaminated sites. While the $10e-6$ starting point expresses EPA’s preference for setting cleanup levels at the more protective end of the risk range, these levels may be revised within the acceptable risk range based on the consideration of appropriate factors including exposure factors, uncertainty factors, and technical factors.”

This language provides a better understanding of the risk estimate and how a risk manager may use these estimates in the risk management of the site. EPA is certainly authorized under the NCP to implement the 1993 ROD and the 2003 Proposed Plan if it is considered that the risks estimates within this risk range pose a threat to human health or the environment, even if the 1×10^{-4} risk level were not exceeded at the Himco Site.

In addition, the cancer risk estimate is only part of the risk evaluation. The non cancer risks at the

Himco Site greatly exceed a cumulative Hazard Index (HI) of unity (1.0) for many of the scenarios and pathways evaluated, with the individual chemical Hazard Quotient (HQ) for target organ or mechanism of action effects also greatly exceeding unity. And as Bayer has commented, EPA OSWER Directive 9355.0-30 (Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, April 1991) regarding the use of MCLs in the risk management process states on page 1: *"However, if MCLs or non-zero MCLGs are exceeded, action generally is warranted"* and again on page 4: *"For ground water actions, MCLs and non-zero MCLGs will generally be used to gauge whether remedial action is warranted."* The MCLs in ground water adjacent to the site are greatly exceeded in private well samples, as well as in monitoring well samples, with contaminants that have been found on the Himco Landfill Site. Thus it would appear the elevated cancer risk level and non cancer risk levels derived for the various receptors and pathways of exposure relevant to the Himco Site and the MCL exceedences detected in ground water would all support the need for further action at the site.

Comment Section IV D, page 48, ROD #4: Bayer has commented that the 1993 ROD remedy was based on a highly implausible, future scenario and that EPA now acknowledges that this scenario is flawed and unreasonable. Bayer has also commented that *"The 1993 ROD remedy is, therefore, arbitrary and capricious."* Bayer has offered two sub-comments in support of this position.

EPA's Response: EPA does not agree with this comment. The present and future land use scenarios in the 1992 RI, which provided the basis for the 1993 ROD decisions, were based on and were consistent with risk assessment guidance at the time. And although the requirements for the Baseline Risk Assessment have been further refined in more recent years to simplify and expedite the process (refer to OSWER Directive No. 9355.7-04, Land Use in the CERCLA Remedy Selection Process, dated May 25, 1995, which is included as an attachment to this Responsiveness Summary), the use of these scenarios in past risk assessments does not make these risk assessments flawed or unreasonable, even though EPA may do the assessment differently now due to changes in guidance and policy which reflect a better understanding of the risk process. However, a major change in the assessment process that was not discussed by Bayer, was the policy to include all contaminants detected in any site media as contaminants in all media, whether or not they have been demonstrated to be present in that media. This may have resulted in risk estimates to some contaminants in some pathways which would not now be evaluated, given newer guidance and an emphasis on better site characterization.

Comment Section IV D, #1, page 48, ROD #5: Bayer has commented that *"The Remedial Investigation determined that current land uses do not pose an unacceptable risk."*

EPA's Response: EPA does not agree with this comment as it does not consider the entire assessment done for this area. While EPA understands that the conclusions of the risk assessment done in 1992 for the residential properties south of the landfill may have shown cancer risk estimates less than 1×10^{-4} , they do wish to point out that the evaluation of the future land uses at the site demonstrated that the site would present a risk to future residential users and that residential land use should be restricted. EPA is certain that Bayer understands that the role of the baseline risk assessment is to develop scenarios for relevant, possible land uses in the absence of

institutional controls in order to provide a sound basis for specific remedial actions, such as site deed restrictions for certain future land uses or for specific actions such as the capping of private wells whose use is no longer desirable due to the installation of a municipal water system. At the time the 1992 baseline risk assessment was conducted, residential, agricultural, and industrial uses were all considered possible although their likelihood differs. The possibility of each of these land uses is based on factors including surrounding land use in the area, historical uses of the land (portions of the site were once agricultural) and developmental feasibility. Additionally, the assessment provided qualitative information on the likelihood of a future land use actually occurring. For example, the Himco site risk assessment clearly stated that there is a low probability of a future residential land use (at least on the landfilled area), there is some likelihood of the site returning to agricultural uses, and there is some probability that the site would be developed for recreational use and indeed development of a golf course was seriously discussed in the very recent past. This type of analysis is useful to all parties, both the PRPs and EPA risk manager, because it allows the selection of remedial actions on the necessary and anticipated future actions for the site.

Bayer's comments also focus exclusively on residential populations who were currently living south of the landfill at the time and who had private wells available to them. Bayer did not discuss the fact that the sodium levels exceeded all health recommendations in these wells, and that these residents were placed on a municipal water system at the request of EPA and ATSDR. Bayer has also failed to consider that future development may take place to the south of the landfill, either on land parcels currently used for residential purposes or land used for commercial/industrial purposes, for which elevated risks were found. The risks to ground water exceeded either the cancer risk action level of 1×10^{-4} or the HQ of 1.0. And the residential wells evaluated in the past are currently still in place and could be used by residents as a potable water source. There is presently nothing that prohibits their use for either potable or non-potable water purposes. There is also nothing that renders it unlikely that future homes or high-density housing would be built on the site south of the landfill in the future. There are currently homes along County Road 10 south of the landfill. The contaminated area between County Road 10 and the landfill, including the area known as the construction debris area (CDA) is obvious a location where future housing might be constructed. Institutional controls such as zoning prohibitions, fencing, posting of signs and other restrictions cannot ensure that the site will never be used in the future for this purpose.

Since the 1992 RI was completed, EPA has installed new monitoring wells in the area to the south of the landfill and has conducted several additional sampling rounds on all the monitoring wells in this area. Contaminant levels which exceeded EPA's risk levels of concern, as well as exceeded MCLs, were found in these wells since the data collection for the 1992 RI. In addition, EPA has conducted several new investigations as part of the SSI/SCR to evaluate exposure pathways which were overlooked in the 1992 risk assessment. These include sampling of the CDA soils and an investigation of the potential for vapor migration from the landfill into nearby homes. The latter investigation also demonstrated the existence of extremely high levels of hydrogen sulfide migrating from the landfill. These new data and assessments document the potential for contaminant exposures and risks which were not considered in the 1992 RI or 1993 ROD.

Comment Section IV D, #2, page 49, ROD #6: Bayer has commented that (a) *"The assumption of future residential use of landfill leachate is completely implausible and unreasonable and not a suitable basis for taking remedial action for ground water."* (b) Bayer has also commented in this section that EPA recognized at the time that *"these hypothetical risks [developed for the future residential scenarios were] unlikely to occur, in part because the site is an unlikely location for any future uses."* (c) In addition, Bayer has suggested that the comments of the EPA Remedial Project Manager (Gwen Massenburg) at the April 23, 2003 public meeting in Elkhart, Indiana had somehow acknowledged that leachate consumption was an unrealistic exposure scenario and not an appropriate basis for justifying the 1993 ROD.

EPA's Response: EPA does not agree with any part of this comment. (a) The 1992 assessment demonstrated that the ground water underlying the landfill site was contaminated, and that it presented a potential risk to future residents should such development occur. As discussed in Chapter 1.0 of the SSI/SCR, sampling conducted since the completion of the 1992 RI has documented the presence of higher levels of site contaminants in ground water. During the course of the 1995 Pre-Design Field Investigation, construction debris was encountered in borings for monitoring wells WT116A and WT116B. The SSI/SCR notes that *"Ground water samples from monitoring well WT116A yielded detects of numerous previously unreported SVOC's, and benzene at 15 micrograms per liter ($\mu\text{g/L}$), which is above the Maximum Contaminant Level (MCL) of 5 $\mu\text{g/L}$. These data suggest that portions or all of the CDA may contain higher levels of contamination than previously recognized in the RI/FS."* It is expected that at on-site locations, where waste remains in contact with ground water, contaminant concentrations are higher than detected in the downgradient wells south of the landfill.

And while Bayer has suggested that the local availability of a municipal water supply makes it a reasonable choice for the water supply for any future development, there is nothing that now restricts any potential developments on the landfill from using the ground water as either as a potable or non-potable water source.....both of which would present a risk to a resident or an on-site worker.

(b) At the time the 1992 baseline risk assessment was conducted, residential, agricultural, and industrial uses were all considered possible although their likelihood differs. The possibility of each of these land uses is based on factors including surrounding land use in the area, historical uses of the land (portions of the site were once agricultural) and developmental feasibility. Additionally, the assessment provided qualitative information on the likelihood of a future land use actually occurring. For example, the Himco site risk assessment clearly stated that there is a low probability of a future residential land use (at least on the landfilled area), there is some likelihood of the site returning to agricultural uses, and there is some probability that the site would be developed for recreational use and indeed development of a golf course was seriously discussed in the very recent past. However, residential and commercial development of properties that were previously used as dump sites is not unusual, and this kind of development occurred frequently in the very recent past (for example, the southern portion of the very affluent suburb of Hinsdale, Illinois just west of Chicago is built on a former dump site, while the Brickyard Shopping Center in Chicago is built on the Cary Landfill). Since there is some likelihood of some kind of future use for land that is situated in close proximity to the City of Elkhart, and since

construction of housing and industrial development has taken place on other landfill sites, it is appropriate for the risk assessment to evaluate future exposures and for risk management decisions to take this information into account in making sites remedial decisions.

This type of analysis is useful to all parties, both the PRPs and EPA risk manager, because it allows the selection of remedial actions on the necessary and anticipated future actions for the site.

(c) Bayer has grossly misinterpreted the comments of the EPA Remedial Project Manager (Gwen Massenburg) at the April 23, 2003 public meeting in Elkhart, Indiana. The quotations provided by Bayer in footnote 154 indicate that Ms. Massenburg actually said that “.....we had a scenario where we said that people were actually living on the landfill and drinking water from the landfill. That would never happen.....We realize that people would never live on the landfill and they would never drink the water beneath the landfill.” Ms. Massenburg’s was addressing concerns raised by the public over the risk estimates in the SSI/SCR from inhalation and consumption of contaminants detected in ground water south of the site. Her comments reflect EPA’s intent to place future land use restrictions on the site as well as restrictions on the use of ground water both on-site and in off-site areas where contaminants have been detected in ground water, through the capping of existing wells and the prohibition of installation of new wells in these areas, so that this hypothetical scenario cannot in fact be realized in the future.

Comment Section IV D, #3, page 50, ROD #7: Bayer has commented that “*Future residential use of ground water south of the landfill is also unlikely, but risks posed by this hypothetical future exposure pathway are not unacceptable, when characterized properly. Consequently the Remedial Investigation does not provide any basis for taking remedial action for ground water.*”

EPA’s Response: EPA does not agree with this comment. Clearly, the remedial actions for ground water that EPA has suggested in the 1993 ROD and updated in the 2003 Proposed Plan are based on the risks assessments conducted in the RI and in the subsequent 2002 SSI/SCR, as discussed in the above responses to comment D. The new assessments for ground water exposure were based on the evaluation of new data from a number of additional wells installed in the CDA, which were not available at the time of the RI report; they did not include any detections to contaminants in leachate or the use of any data from the 1992 RI, as discussed in Chapter 1.0. Thus to focus exclusively on the results from the 1992 RI, while ignoring all the site investigation work over the past ten years and the data that has been collected since that report was completed, is both erroneous and unscrupulous.

Bayer has further suggested in this comment that “*Future residential use of ground water immediately south of the landfill is not likely, given the availability of a municipal water supply*” and that the 1993 ROD is capricious and arbitrary in addressing ground water south of the landfill. It can only be concluded that Bayer does not support the capping of existing wells in the CDA area nor imposing any restrictions on the installation of new wells in this area. Rather, it appears that they would support the use of ground water by residents in this area even when it has been demonstrated that sporadic releases of contaminants to ground water in the area are continuing into the present. EPA does not agree with this position.

Comment Section IV D, #4, page 53, ROD #8: Bayer has commented that “*Cancer risks posed by residential use of the CDA are not unacceptable, when characterized properly. Consequently, the Remedial Investigation does not provide any basis for taking remedial action for the CDA soils.*”

EPA’s Response: EPA does not agree with this comment. EPA collected additional data for the SSI/SCR and evaluated the cancer risks for a combined child/adult resident and for a construction worker and the non-cancer risks (HIs) for a child resident and for a construction worker at all land parcels, both residential and undeveloped commercial/industrial parcels, consists with standard risk assessment assumptions for such a site. EPA has also stated that there is nothing that renders it unlikely that future homes or high-density housing may be built on the site south of the landfill in the future. There are currently homes along County Road 10 south of the landfill. The contaminated area between County Road 10 and the landfill, including the area known as the construction debris-area (CDA) is obviously a location where future housing might be constructed. Because no agreement could be reached as to the future use of any parcels, residential or nonresidential, and because the options are infinite, EPA chose to evaluate the CDA soils for a future residential land use, with the expectation that any future development of any land parcels would require a use-specific risk assessment. Since there is a likelihood of some kind of future use for land that is situated in close proximity to the City of Elkhart, and since construction of housing and industrial development has taken place on other landfill sites, it is appropriate for the risk assessment to evaluate such exposures using a future land use scenario and for risk management decisions to take this information into account in making sites remedial decisions, including land use zoning restrictions.

Soil samples collected from the Construction Debris Area demonstrated the presence of polynuclear aromatic hydrocarbons (PAHs) and the metals’ aluminum, antimony, arsenic, copper, manganese, mercury, lead and nickel at concentrations that may be associated with CDA dumping activities. As previously stated, the CDA sampling was conducted as a screening exercise. Soil sampling of the parcels was sparse and not all land parcels, either residential or commercial, was sampled, so there is great uncertainty as to whether these estimates are inclusive of all CDA soil constituents or are representing the maximum risks that might be expected from exposure to the CDA soils. Because the CDA soils have not been fully characterized, it is highly likely that not all CDA soil contaminants were identified nor were the highest contaminant concentrations determined. Also, as has been clearly stated in the SSI/SCR and in earlier responses by EPA on this issue, soil samples were obtained from parcels D, F, M, O, P and S only. No soil samples were collected from land parcels N, Q, R, and T. The risks were projected for these parcels, based on geostatistical modeling of two contaminants only, arsenic and benzo(a)pyrene, and thus are highly uncertain. Thus, risks in these parcels are most likely underestimated. However, it was never the intention to fully characterize the CDA soils in these screening samples, and EPA has noted that Bayer had previously submitted a Work Plan for the sampling of the CDA for the purpose of determining if the soil contained any constituents that present a risk to human health. EPA completed this task, and the screening sampling has demonstrated a potential for concern for exposure to CDA soils.

Comment Section IV E, #1, page 54, ROD #9: Bayer has commented that “*The*

Supplemental Site Characterization Report (SSCR) did not provide evidence of any unacceptable health risk to nearby residents that is related to soil gas migration.” In the discussion that follows, Bayer comments that (a) that “approximately half of the sampling locations.....did not yield detectable levels of methane and in only a few locations near the landfill did VOC concentrations exceed levels that might pose an unacceptable risk for ambient air,” and (b) EPA did not assess the risks posed by VOCs or methane in soil gas. Bayer concludes “based on these data, methane and VOCs in soil gas do not warrant remedial action under CERCLA.”

EPA’s Response: EPA does not agree with these comments or Bayer’s conclusions. EPA believes that the results of the soil gas sampling events demonstrate that methane, hydrogen sulfide and other VOCs are migrating from the landfill toward off-site residences to the south and east, and that the installation of an active landfill gas collection system will be required to control the migration of toxic and explosive gases that are presently migrating from the site for the reasons that follow: (a) Bayer’s comments suggest that they do not understand the purpose of the soil gas sampling or how such results are to be used, although Bayer did submit a Work Plan for this sampling in 1998. The Draft *Work Plan for Supplemental Site Characterization and Access Controls at the Himco Landfill NPL Site, Elkhart, Indiana*, prepared and submitted to EPA by QST Environmental at the request of the Himco PRP Group on January 6, 1998, presented a sampling strategy for such sampling. However, it is also clear that Bayer did not understand at that time that some VOCs (primarily the chlorinated hydrocarbons) have been demonstrated to migrate ahead of the methane plume. Thus, the Bayer/PRP Group efforts proposed to focus on methane, consistent with the comments provided here. The Bayer/PRP group never initiated this sampling, and EPA undertook this task, following the sampling scheme proposed in the Bayer/PRP Group Work Plan.

Regarding the soil gas sample results, EPA notes that the Work Plan states: “ Previous investigations to characterize soil gas constituents generated from the landfill have focused on the area within the boundaries of the landfill (Donahue, 1992; Quadrel, 1995). The purpose of this soil gas survey at the Himco Dump Site is to determine whether landfill generated constituents in the soil gas are migrating horizontally away from the landfill to the south and east, where residences are located, and to quantify the levels of those constituents which are migrating.” “Initially, 15 locations will be sampled along the southern and eastern boundary of the landfill (Figure 2). These initial points will be located approximately 50 feet from the landfill boundary and at approximately 200-foot intervals. Constituents to be sampled include methane, hydrogen sulfide, and non-methane volatile organic compounds. Where the concentration of methane is detected at concentrations equal to or greater than 25% of the lower explosive limit (LEL) at an initial sampling location, then two additional locations will be sampled stepping away from the landfill boundary in order to evaluate the attenuation of the detected constituent(s). Each secondary location will be approximately 70 feet in a direction of 45 degrees either side of the initial sampling location such that the three locations form a triangle. With this sampling configuration, the secondary sampling points will fall on a line parallel to but 50 feet farther away from the landfill boundary. The secondary locations will also be sampled for methane, hydrogen sulfide, and non-methane volatile organic compounds.”

The initial round of soil gas sampling conducted by EPA unexpectedly detected methane and

VOCs in soil gas at highly elevated concentrations. The sampling was thus continued, in the stepwise manner described, during several distinct sampling events, until the VOC and methane concentrations in the soil gas samples were non-detect. Thus, the results at all offsite sampling locations on the perimeter of the sampled area would, by design, yield undetectable levels of methane or other VOCs.

(b) The soil gas sampling was conducted in accordance with a decision made at a meeting at the Bayer facilities in which both Bayer and EPA agreed that the collection of soil gas samples would provide adequate documentation of a vapor migration pathway and that the collection of indoor air samples in homes would not be desirable or required for future decision-making at the site. At no time was it ever considered that the soil gas samples would be used to evaluate risks in ambient air. As previously stated, because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations in homes, the sampling points were not located near (within 10 feet) or underneath the residences. The 2002 EPA OSWER Draft Guidance for Evaluating Vapor Intrusion to the Indoor Air Pathway From Groundwater and Soils uses a three-tiered approach for assessing the vapor intrusion pathway, including primary and secondary screening of a site followed by a site-specific pathway assessment. The initial screening is based on the presence of contaminants in soil gas or ground water within 100 ft of a building designed for human occupancy. The document also discusses the potential for mobile "vapor clouds" (gas plumes) which are caused by methane carrier gas in the vicinity of landfills, and which have been known to travel 100s of feet in distant from the landfill site.

The Phase I and Phase II soil gas sampling conducted in areas both south and east of the Himco Dump site clearly shows that contaminants have been found in soil gas within 100 ft of residential structures. The concentration of volatile contaminants detected in these soil gas samples suggests the potential for an intact vapor intrusion pathway. Sampling in the area to the east of the site has detected contaminants in soil gas samples taken in public areas (parkways) both west (between the landfill and the residential structures) and east of the structures, suggesting the homes are positioned to naturally intercept this vapor movement during periods when the ground is frozen and escape of volatile gases to ambient air is blocked.

Because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations, the data were not considered by EPA to be suitable for modeling volatile gas concentrations in indoor air. Therefore, the data were not used quantitatively to estimate risks to indoor air exposure. However, a qualitative discussion of the soil gas sampling results is presented in Chapter 5 of the SSI/SCR. Figures 5-1 through 5-4 present the contoured concentration data for the compound classes BTEX (benzene, toluene, ethyl benzene and xylene), chlorinated ethenes, chlorinated ethanes and vinyl chloride. All of the listed compound classes, as well as carbon disulfide, were found along the entire length of the southern off-site area of the landfill where sampling was performed. In one location south of the landfill, in the CDA, hydrogen sulfide levels were so great that the instrument detector was affected and sampling had to be halted.

Comment Section IV E, #2, page 54, ROD #10: Bayer has commented that "*The Supplemental Site Investigation/Characterization Report (SSCR) did not provide evidence of any unacceptable health risk to nearby residents that is related to CDA soils.*" Bayer has also commented that future residential development of nonresidential parcels is unlikely, and a risk assessment should have been performed for nonresidential exposure scenarios.

EPA's Response: EPA does not agree with this comment. EPA again notes that Bayer's comment focuses on parcels that are currently used for residential land uses only. EPA has evaluated the cancer risks for a combined child/adult resident and for a construction worker and the non-cancer risks (HIs) for a child resident and for a construction worker at all land parcels, both residential and undeveloped commercial/industrial parcels, consists with standard risk assessment assumptions for such a site. EPA has also stated that there is nothing that renders it unlikely that future homes or high-density housing may be built on the site south of the landfill in the future. There are currently homes along County Road 10 south of the landfill. The contaminated area between County Road 10 and the landfill, including the area known as the construction debris area (CDA) is obviously a location where future housing might be constructed. Because no agreement could be reached as to the future use of any parcels, residential or nonresidential, and because the options are infinite, EPA opted to evaluate the CDA soils for a future residential land use, with the expectation that any future development of any land parcels would require a use-specific risk assessment. Since there is a likelihood of some kind of future use for land that is situated in close proximity to the City of Elkhart, and since construction of housing and industrial development has taken place on other landfill sites, it is appropriate for the risk assessment to evaluate such exposures using a future land use scenario and for risk management decisions to take this information into account in making sites remedial decisions, including land use zoning restrictions.

EPA has previously noted that in Chapter 11 (Conclusions), the risk assessment states "*Soil samples collected from the Construction Debris Area demonstrate the presence of polynuclear aromatic hydrocarbons (PAHs) and the metals' aluminum, antimony, arsenic, copper, manganese, mercury, lead and nickel at concentrations that may be associated with CDA dumping activities. The volatile organic compounds 1,1-dichloroethane, benzene, ethylbenzene, and xylene were detected in one sample with no other site related volatile organic compounds reported.*" In addition, lead was detected above the residential screening level in land parcel F in one surface soil sample at an estimated concentration of 695 mg/kg. Lead was also detected in other surface, near surface and subsurface soil samples at land parcels F, D, S and O (no soil samples were collected at Land Parcel N, R, Q and T). Although the concentrations detected were below the screening level, the concentrations represent lead concentrations in unsieved samples. It has been determined that lead concentrations in soil generally increase with decreasing particle size; concentration factors of 1.4 and greater for the fine fraction of soil that most readily sticks to children's hands (the ingestible fraction as determined by sieving of the soil) been reported at Superfund sites. Therefore, use of the total soil concentrations likely underestimates the overall child health risk to lead in the identified parcels. When all receptor populations are considered, the cancer risk to the resident from exposure to CDA soil in all parcels was estimated to range from 1.9×10^{-5} (in un-sampled parcel N) to 1.5×10^{-4} , with the risk at or exceeding 10^{-4} in two parcels (F and S). The cancer risk range for a construction worker from exposure to CDA soils was $> 10^{-6}$

to 4.6×10^{-6} . The non-cancer risk (HI) to the residential child due to exposure to CDA soil was estimated to range from 0.11 (in un-sampled parcel N) to 4.5 (in parcel F due to arsenic and the non-cancer effects of benzo(a)pyrene). The non-cancer risk (HI) to a construction worker in parcel F was estimated at 1.3. Thus it is clear that both cancer and non-cancer estimated risks exceed an unacceptable risk level in some parcels in the CDA. .

Also, as previously stated, the CDA sampling was conducted as a screening exercise. Soil sampling of the parcels was sparse and not all land parcels, either residential or commercial, was sampled, so there is great uncertainty as to whether these estimates are inclusive of all CDA soil constituents or are representing the maximum risks that might be expected from exposure to the CDA soils. Because the CDA soils have not been fully characterized, it is highly likely that not all CDA soil contaminants were identified nor were the highest contaminant concentrations determined. EPA notes that in support of this comment, Bayer has included foot 167: "See SSI/SCR, Tables 9-11 (Parcel M), 9-12 (Parcel O), Table 13, (Parcel N), Table 9-14 (Parcel P), and 9-16 (Parcel T) and page 9-52; Nonresidential parcels O (see Table 9-17), R (see Table 9-17), and D (see Table 9-20) also met these no-risk criteria." As it has been clearly stated in the SSI/SCR and in earlier responses by EPA on this issue, soil samples were obtained from parcels D, F, M, O, P and S only. No soil samples were collected from land parcels N, Q, R, and T. The risks were projected for these parcels, based on geostatistical modeling of two contaminants only, arsenic and benzo(a)pyrene, and thus are highly uncertain. Thus, risks in these parcels are most likely underestimated. However, it was never the intention to fully characterize the CDA soils in these screening samples, and EPA has noted that Bayer had previously submitted a Work Plan for the sampling of the CDA for the purpose of determining if the soil contained any constituents that present a risk to human health. EPA completed this task, and the screening sampling has demonstrated a potential for concern for exposure to CDA soils.

Perhaps the most important conclusion from the screening sampling is that contaminants may be present anywhere in the CDA soils at concentrations that could exceed risk levels. A final conclusion of the CDA analysis, as stated in Chapter 11 of the SSI/SCR, is that "CDA soils have demonstrated a potential risk from repeated exposure and should be removed."

Comment Section IV E, #3, page 55, ROD #11: Bayer has commented that "*The Supplemental Site Investigation/Characterization Report (SSCR) demonstrated that down-gradient ground water quality conditions are acceptable and do not pose any health risk.*" Bayer has further commented that the Maximum Contaminant Levels (MCLs) in drinking water have not been exceeded between 1998 and 2000, so no further action is warranted.

EPA's Response: EPA does not agree with this comment. As EPA has indicated, during the 1998 ground water sampling events a high detection limit ($10 \mu\text{g/L}$) was used in the sample analysis making it impossible to know if MCLs for volatile organic contaminants were exceeded in this sampling event. Attenuation of contaminant concentrations and compliance with drinking water MCLs cannot be based on a single sampling round in 2000. Most volatile organic contaminants of interest in drinking water have MCLs well below $10 \mu\text{g/L}$, with some (e.g., vinyl chloride and benzo(a)pyrene) having MCLs at $2 \mu\text{g/L}$ and $0.2 \mu\text{g/L}$, respectively; thus, it is

unlikely that these would have been detected in the 1998 and earlier sampling events. In addition, the four sampling rounds in WT116A and two sampling rounds in WT119A were taken at different times of the year. Seasonal variations in contaminant concentrations have been demonstrated in ground water at other Superfund Sites (e.g., the Roy Blackwell Forest Preserve Landfill, Du Page County, Illinois) when quarterly data were available. Higher contaminant concentrations, that exceeded MCL values, have been detected in some samples taken from well WT116A, suggesting that contaminant levels in ground water at the Himco site may exhibit seasonal variation as well. However, for the reasons stated above, no time trends in contaminant concentrations can be projected from these data. Periodic monitoring of site wells will be required to determine whether significant elevation in contaminant levels are indeed occurring at this site or site contaminant levels are attenuating. Residual residential wells located down-gradient of the Himco Dump should be capped to prevent their use during this period of time.

Comment Section IV F, page 56, ROD #12: Bayer has commented that *“The 2003 Proposed Plan has been justified by EPA on the basis of a revised risk assessment for ground water that shows health risks to be in the acceptable range. Although the revised risk assessment is flawed, correcting these flaws also yields acceptable risks, which demonstrates that remedial action for ground water is not warranted under CERCLA and the NCP.”* The discussion in this comment is not focused but instead alludes to multiple issues. The comment suggests (a) that the lifetime cancer risk of 4×10^{-4} due to ground water use south of the landfill calculated in the risk assessment is within the acceptable risk range according to EPA guidance; (b) that the revised risk assessment is flawed; and (c) that when corrected using Bayer’s criteria, the results indicate that the cancer risks for future receptors are acceptable.

EPA’s Response: EPA does not agree with any part of this comment. (a) EPA has previously addressed the concept of the “acceptable” risk range in the comments for Section III H, SB #2. Regarding EPA’s acceptable risk range, there is no risk within this range that can be characterized as “acceptable” without further evaluation. EPA HQ views a 10^{-6} risk level as the “point of departure” for requiring further investigation of the hazard, and the 10^{-4} risk level as the immediate action or removal trigger level. For everything in between, “it all depends”; the final decision is in the details. EPA does not consider the magnitude of the risk value (the “number”) alone but also the assumptions used in the calculation and the uncertainties in the calculated value. Any value in the risk range may trigger a remedial action. And while a risk in the immediate range may or may not result in some remedial action (a risk management decision), it is clear that there is a risk that exceeds EPA’s definition of a minimal risk level (a risk assessment decision). (b) EPA does not believe that the revised risk range is flawed, as suggested by Bayer. The revised risk assessment considered all the data which meets the very stringent criteria developed for use in a quantitative risk assessment. That the risk assessment was not based solely on the results of the most recent monitoring data does not make the risk assessment flawed. Long term monitoring will be needed to determine whether contaminant concentrations in ground water can actually meet MCL levels. (c) EPA has commented on the “Bayer corrected” risk assessment in the comments for Section V, and will not address this assessment in a piecemeal fashion here.

Comment Section IV G, page 57, ROD #13: Bayer has commented that *“The*

cumulative risk to current and future residents south of the landfill is in the acceptable range, when properly assessed. The Himco landfill site, therefore, does not warrant remedial action under CERCLA and the NCP.” The comment further refers to Table 4 in the Bayer package as the results of various risk assessment conducted for the Himco Dump Site.

EPA’s Response: EPA does not agree with this comment. Table 4 does not contain any discussion of assumptions, data, methodology or uncertainties considered in the development of the risk assessment results sketchily summarized within. Thus, this comment cannot be seriously considered. In addition, EPA has commented on the “Bayer corrected” risk assessment in the comments for Section V, and will not address this assessment in a piecemeal fashion here.

Comment Section IV H, page 57, ROD #14: Bayer has commented that “*Remedial action at the Himco landfill cannot be justified based upon the results of well sampling in 2000 at residences east of the landfill, because there is no evidence that these wells are down-gradient of the Himco landfill and EPA did not complete a risk assessment for these wells. An original independent health risk assessment shows that ground water from these wells does not pose an unacceptable health risk to residents.*” Bayer further refers to a discussion in “Section II” of their comment package as evidence that ground water contamination east of the landfill “*may not*” be related to the Himco Dump Site.

EPA’s Response: EPA does not agree with this comment. EPA could find no discussion addressing the ground water flow to the east of the Himco Dump Site in Section II of the Bayer comment package. However, EPA has stated previously in response to Section III H, GW #6, that Section 3.1 of the SSI/SCR contains a discussion of the ground water flow at the Himco Dump site. The report states:

“Two water level surveys were completed between March and April of 2000 to assist with the interpretation of ground water flow directions at different depths within the aquifer beneath the Himco Dump Site. Ground water levels and elevations for the April 2000 event are summarized in Table 3-1. The water level data were grouped and contoured according to monitoring well screen depths. Data for shallow levels of the aquifer were obtained from monitoring wells screened across or within approximately 30 feet of the water table (shallow monitoring wells). Data for intermediate levels of the aquifer were obtained from monitoring wells screened approximately 60 to 100 feet below ground surface (intermediate monitoring wells), and data for deep levels of the aquifer were obtained from monitoring wells screened greater than 100 feet below ground surface (deep monitoring wells).

Overall, ground water at or near the water table appears to be flowing predominantly to the south-southeast across the Himco Dump Site; however, local variations in the flow direction are apparent. [Emphasis by EPA] These local flow variations may in part be the result of unequal monitoring well distribution across the Himco Dump Site, which results in more speculation in the interpolation of ground water elevation contours in areas with a lesser density of sampling points. The overall direction of ground water flow is consistent with other published regional and site-specific interpretations of ground water elevation data (Imbrigiotta and Martin, 1981; Duwelius and Silcox, 1991; Donahue, 1992).

Ground water flow in the southern portion of the site where shallow monitoring well density is the greatest is toward the south to southwest. The gradient appears to steepen significantly in the vicinity of the landfill proper near monitoring well WT103A. One possible explanation for this increased gradient is a localized mounding effect from two ponds located immediately adjacent to and north (upgradient) of WT103A. Another possible cause for the ground water gradient to steepen in the vicinity of WT103A is mounding of the water table beneath the landfill. Neither of these scenarios can be verified given the current number and distribution of monitoring wells nor the number of monitoring events; however, ground water elevation data obtained during the RI supports the interpretation that the ponds exert some control on the ground water flow. A comparison of ground water levels obtained during the RI from staff gauges installed in all three ponds at the Himco Dump Site and surrounding monitoring wells showed close correlation in water table elevations. This would indicate that the ponds act as a recharge source for the aquifer, but mounding of the water table does not occur as a result of their existence. It is more likely that the increase in the water table gradient seen in Figure 3-1 is related to the existence of material of different hydraulic conductivity (i.e. landfill-related material).

Ground water flow directions and gradients for the central portion of the site are highly speculative as no monitoring wells exist in this region. [Emphasis by EPA] One possible scenario involves mounding of the water table underneath the landfill as suggested above. In this case, the landfill could exert a significant amount of influence on the ground water gradient, and potentially the flow direction. The red colored contours shown in Figure 3-1 are one interpretation of the ground water flow regime involving ground water mounding and radial flow away from the landfill. The ground water flow direction is shown to vary widely in the central portion of the site from south to east to northeast, depending on the location relative to the landfill boundary. Another data interpretation where there is no mounding effect from the landfill is shown on Figure 3-1 by the blue colored contour lines. [Emphasis by EPA] In this scenario, the ground water flow direction is shown to flow more consistently in a south to southeast direction.

Ground water flow at or near the water table in the northern part of the site is toward the southeast as shown in Figure 3-1. The interpolated contours are based on a somewhat limited number of data points. [Emphasis by EPA]

Contoured April 2000 ground water elevation data from the intermediate monitoring wells (Figure 3-2) indicates flow predominantly to the southeast, with a southwest flow component in the southwest corner of the site. [Emphasis by EPA] In general, the overall flow direction in the intermediate levels of the aquifer is similar to that in the shallow levels. The effects of the mounding due to the landfill and/or the ponds are expected to be dissipated by the intermediate level of the aquifer because of the high hydraulic conductivities. A more detailed discussion on hydraulic conductivities of the aquifer beneath the Himco Dump Site can be found in Chapter 7.

Thus, it is EPA's opinion that the existing data are not sufficient to say that the ground water contamination detected in wells located to the east is not related to the Himco Dump Site. In addition, no other potential source of this contamination has been identified in the area.

Regarding Bayer's comment that a quantitative risk assessment based on the single-season sampling of the residential wells in the area to the east is lacking, EPA has previously stated in the response to Section III H, GW #8, that the decision not to conduct such an assessment is based on the criteria for use of ground water data in a quantitative risk assessment, as discussed in detail in chapter 4.0 of the SSI/SCR. In Section 4.2.7, EPA has explained that *"The residential well analytical data, collected during the March, April/May and November 2000 sampling events, meets the five criteria established in Section 4.1, and are usable in a quantitative manner and to qualitatively support the risk assessment which follows in this report with the exception of the metals/cyanide data collected during the March and April/May 2000 and the emerging contaminants data. The metals data obtained from residential water well samples collected during the March and April/May 2000 sampling events are unusable in a quantitative manner or to qualitatively support the risk assessment as no turbidity measurements were obtained during the sampling process."* [EPA's emphasis.]

EPA does not believe that there would be any benefit in conducting a partial risk assessment using the VOC contaminants only. The inability to develop risk estimates using all the ground water contaminants and pathways of exposure to ground water makes such an exercise meaningless, if not undesirable. However, data from monitoring well and direct push sampling rounds was available and was used in the SSI/SCR in the quantitative estimation of risk to the residents living to the east of the landfill. All target organ HIs for non-cancer risks exceed unity ($HI > 1.0$) in this assessment. In addition, in those cases where the contaminant concentrations used in the quantitative risk assessment were less than those detected in the residential wells (for example, the use of 2 µg/L instead of 10 µg/L for the detection of 1,2-dichloropropane), the risks to the eastern residents have been underestimated in the quantitative risk assessment presented in the SSI/SCR.

EPA has commented on the "Bayer corrected" risk assessment in the comments for Section V, and will not repeat that response here.

Comment Section V A, #1, page 59, RA #1: Bayer has commented that *"The revised risk assessment is based on flawed and improper 'site attribution' analysis."* Bayer has further commented that *"The 'site attribution' analysis is based upon an inappropriate and inapplicable statistical test."*

EPA's Response: EPA does not agree with this comment. Comparison with background levels is only appropriate for naturally-occurring compounds. Comparison of the maximum ground water value with the average background concentration has been done in Region 5 risk assessments when good data identifying the center of the contaminant plume do not exist. The Region 5 guidance, *Future Residential Land Use Ground Water Exposure Point Concentrations for the Baseline Risk Assessment*, May 19, 1991, recommends that the contaminant concentration used to calculate the reasonable maximum exposure should be the concentration at the center of the contaminant plume, which is assumed to be the location presenting the highest risk to the receptor. When good monitoring well data exists, the exposure point concentration should be the upper 95% confidence limit on the arithmetic mean of the contaminant concentrations found in at least three monitoring wells located at the center of the aquifer's contaminant plume. The

guidance further states that *"If good data identifying the center of the contaminant plume do not exist, modeling is not performed, and the collection of additional samples [from additional wells] is precluded, generally the well with the overall highest concentration of contaminants of concern should be used as the exposure point concentration. This is reasonable and does not constitute the worst case risk because it is highly likely that under these conditions, the true highest contaminant concentrations have not been detected in sampling."*

It is unknown whether the monitoring wells have been located in such a manner that the center of the contaminant plume has been located. The wells sampled in the SSI/SCR are identical to those designated in the *Work Plan for Supplemental Site Characterization and Access Controls at the Himco Landfill NPL Site, Elkhart, Indiana*, prepared by QST Environmental and submitted to EPA in January 1998 by the Bayer Corporation, and no additional wells were available to identify the center of the contaminant plume in the SSI/SCR. The Work Plan, Section 2.3 Ground Water Monitoring, specified that *"New well MW119A and existing wells WT116A, MW114A and MW101A will be sampled to obtain supplemental data regarding the quality of shallow ground water downgradient [south and southeast] of the landfill."* However, EPA also compared the maximum monitoring well contaminant concentrations with the maximum background well concentrations, considering those wells similar in depth to the monitoring wells identified above. Contaminant concentrations in monitoring wells were found to be several times higher than concentrations in background wells (see the response to the comment below and additional responses on this issue to Appendix C comments).

Comment Section V A, #2, page 60, RA #2: Bayer has commented that *"The SSCR considered only two shallow wells in characterizing background ground water quality. The SSCR did not consider any deep background wells in characterizing background ground water quality even though EPA was concerned about the eastern residential wells and at least some, if not all, of these wells are deep."*

EPA's Response: EPA does not agree with this comment. The wells sampled in the SSI/SCR are identical to those designated in the *Work Plan for Supplemental Site Characterization and Access Controls at the Himco Landfill NPL Site, Elkhart, Indiana*, prepared by QST Environmental and submitted to EPA in January 1998 by the Bayer Corporation. The Work Plan, Section 2.3 Ground Water Monitoring, specified that *"Two upgradient wells (WT102A and WT112A) will also be sampled."* Thus, EPA's further characterization activities are consistent with those proposed by Bayer in 1998.

However, EPA has further responded to this comment in the comments to Appendix C. Human Health Risk Assessment Regarding Ground Water, Section IVA, and compared metallic compound concentrations with background ground water concentrations in all background wells sampled. As the following comparisons demonstrate, comparison with any or all background ground water well data does not change the characterization for the eastern residential wells.

In the Appendix C response, EPA noted that the ground water *arsenic* levels were less than the 2 µg/L detection limit in 9 of the 13 residential wells sampled, suggesting that the background level of arsenic in ground water in the area east of the Himco Dump site is very low. Moreover, in

the 1995 sampling, during which arsenic levels of 23.3 µg/L and 18.5 µg/L were detected in WT114A and WT114B, arsenic levels did not exceed 4.8 µg/L in any background well; this is the maximum value detected in intermediate depth monitoring well WT102B. In addition, arsenic levels in the 10 monitoring wells available to establish background levels in the 2000 Spring sampling event (WTB1, WTB3, WTB4, WT102A, WT102B, WT102C, WT112A, WT112B, WT113A and WT113B) did not exceed a maximum of 6 µg/L (WT102B). Thus, it is clear that elevated levels of arsenic were consistently found in monitoring wells (WT 114A, WT114B) located east of the Himco Dump site.

Iron levels between 5,000 µg/L and 6,000 µg/L were found in three of 13 residential wells sampled. Iron levels in wells available to characterize background in the 2000 Spring sampling event ranged from 23.3 µg/L - 2210 µg/L, with the maximum level being detected in one very deep well in the series (WT102C), suggesting that the iron levels in these residential wells are significantly greater than the local background levels

The level (1,560 µg/L - 1,880 µg/L) of manganese found in one of 13 wells is approximately two times the non-cancer trigger level for manganese in drinking water (880 µg/L). Manganese levels in wells available to characterize background in the 2000 Spring sampling event ranged from 3.1 µg/L- 356 µg/L, with level greater than 100 µg/L detected in only two wells in the series (WTB3, WTB4).

Comment Section V A, #3, page 61, RA #3: Bayer has commented that *"Each of several background wells should have been systematically sampled and analyzed during each sampling event to characterize background ground water quality. For at least two events, background ground water samples were not collected from any background well."*

EPA's Response: EPA does not agree with this comment. The two sampling events referred to by Bayer were to address special concerns at the site, not to gather routine monitoring data. The objective of the 1996 Supplemental Site Investigation was to confirm the ground water analytical detections of the 1995 Pre-Design Field Investigation, primarily benzene found in monitoring well WT116A. In consultation with Indiana Department of Environmental Management, adjacent and downgradient wells were chosen to be sampled. The analytes selected were those detected during the 1995 sampling event. Ground water samples were collected from only five monitoring wells (WT105A, W T106A, WT111A, WT115A and WT116A).

The reason for not collecting background samples for the sampling of human effective compounds (HECs), as well as the dioxane and tetrahydrofuran (THF) sampling, was threefold. The first was cost, as the USGS did most of the analyses for free; therefore EPA was limited in the number of samples that could be run. Second, these compounds are not naturally occurring, so any detections would have had to been from an anthropogenic source. The location of the wells sampled indicated only the landfill as a potentially viable source. And the third reason was the objective of the sampling. The objective was limited to determining whether the compounds would be of interest for this site, and whether further sampling of these compounds in future monitoring programs should be incorporated. EPA considered that these sampling efforts would not be used in a final site decision.

Comment Section V A, #4, page 62, RA #4: Bayer has commented that *"The SSCR should have considered bromide concentration levels in identifying wells that might be impacted by landfill leachate. Because the SSCR did not, it mis characterized background concentrations of arsenic and other substances."*

EPA's Response: EPA does not agree with this comment. The attenuation mechanisms vary based on the contaminants. A non-reactive contaminant such as bromide has only advections, dispersion and dilution as the major attenuation mechanisms. All of the contaminants will have advection, dispersion and dilution effects. For many of the metals, the likely additional attenuation mechanism is precipitation/dissolution and oxidation/reduction with some sorption. For the organic compounds, sorption may be limited. Some biodegradation may be occurring, but most likely confined to within and in the immediate vicinity of the landfill. This conclusion is supported by the apparent rapid disappearance of organics between the soils/leachate samples and the ground water wells closest to the site. Volatilization losses through the landfill cover and movement of soil gas off-site may also account for the loss of volatiles. What sorption is present, is most likely within the landfill materials, as indicated by the non-detections of the low mobility, hydrophobic compounds; indicated by the low solubility numbers in Table 7-2 of the SSI/SCR.

To illustrate how the potential contaminants may have moved through ground water, a review of the movement of the bromide plume through the ground water system at the Site was presented in Chapter 7 of the SSI/SCR. The bromide trends indicate that past concentrations of contaminants may have been greater than is currently observed. This is clearly illustrated in Figure 7-18 by how the bromide plume has changed over time. Three periods of data collection are presented in Figure 7-18; November/December 1980, August 1988 and April/May 2000. Approximately 10 years separates each of the sampling events, which allows for sufficient time between sampling events to pass for illustrative purposes. The first two dates of data collection were presented in the 1991 USGS Report (Duwelius and Silcox, 1991). The last sampling date presented is the last round of extensive sampling completed on the site. Limitation on the use of this data is that very few wells have been sampled for all of these sampling events. Monitoring wells WTE1, WTE3, WTG1 and WTG3 have been the only wells sampled for each of these events.

The 1980 data indicate extensive bromide plumes in both the shallow and deep portions of the upper aquifer, and in the lower aquifer. The highest concentrations are centered around the WTE and WTM clusters of monitoring wells on the southeast portion of the landfill. The highest bromide concentration detected from all wells was 3.8 mg/L in WTM1, which is in the lower aquifer. This was also where the USGS detected TCE in 1979 at 55 µg/L.

The 1988 data indicate a high value of bromide at WTM2 in the shallow well in the upper aquifer, but generally lower values of bromide in the rest of the shallow wells in the upper aquifer. The deeper wells in the upper aquifer show the bromide plume to have migrated further south, centered on the WTJ cluster. One caution with this data interpretation is that there is not a deeper well in the shallow aquifer at the WTM cluster and that the main part of the plume could be between the WTI and WTJ well clusters, as these two clusters approximately 0.75 miles apart. Data from the lower aquifer indicate little change from 1980. The highest concentration of bromide was found in WTE3 in the lower aquifer.

The 2000 data indicate generally lower concentrations of the bromide in all three layers presented. However, one caution that should be kept in mind is that the WTM cluster was not available for sampling (having been removed by the USACE in 1996). The WTE cluster has shown significant decreases of bromide with time. However, the downgradient clusters (WTI and WTJ clusters) were not sampled as a part of the 2000 sampling event. Therefore, the extent or lateral migration of the bromide plume downgradient was not determined. The WTI cluster had apparently been destroyed in the late 1990's and was unavailable for sampling. WT116A, a new shallow well in the upper aquifer, had the highest concentration of bromide at 2.4 mg/L. This well is not far from the former WTM cluster location.

The trends indicated in Figure 7-18 of the SSI/SCR support the analytical trends discussed in Section 7.4 and presented in Figures 7-11 through 7-15. Therefore, similar maps could be prepared as shown in Figure 7-18 for other contaminants found in ground water. For the organic compounds, the inconsistent detections may make this more difficult. For the inorganic compounds, and other parameters, such as SEC, this would be easier than the organics.

The elevated bromide detected in ground water, supports the conclusion that the landfill is still contributing to ground water quality degradation, as indicated by the trends between WTM2/WT116A. Furthermore, this trend would be expected to continue because of the lack of source removal or control. In addition, if a conservative tracer, such as bromide, is still present in shallow ground water by the landfill at concentrations that are not much lower than those found 20 years ago, then the possibility of other contaminants that are not as mobile entering the ground water flow system is likely. This confirms the continued detections of organics and other contaminants that have been detected over time, and would likely continue.

Comment Section V A, #5, page 63, RA #5: Bayer has commented that "*A site attribution" analysis that is based upon an appropriate and applicable statistical test, multiple background wells including deep wells, and relative bromide concentrations reveals that antimony, arsenic, thallium, and bis(2-ethyl)hexyl phthalate are not site-related chemicals of potential concern (COPCs) in ground water south of the landfill and chromium and bis(2-ethyl)hexyl phthalate are not site-related COPCs in ground water east of the landfill.*"

EPA's Response: EPA does not agree with this comment. The issues related to the site "attribution" analysis (appropriate and applicable statistical test, multiple background wells including deep wells, and relative bromide concentrations) have been discussed in depth in RA # one through RA #four above and in the comments to Appendix C, Section V.

Bayer's comments that antimony, arsenic, thallium, and bis(2-ethyl)hexyl phthalate are not site-related chemicals of potential concern (COPCs) in ground water south of the landfill are not supported by the data. Background well WT102A exhibited an *antimony* level of 21.7 µg/L in the 1998 sampling; the maximum value in WT116A was compared to the average concentration in the background wells (12.4 µg/L). However, antimony was not a driving chemical in the risk assessment, and the target non carcinogenic Hazard Index still greatly exceeds unity (1.0) based on the presence of other metal contaminants if antimony is eliminated. For *arsenic*, the maximum detection of 6 µg/L (WT119A; 2000) used in the CDA assessment exceeds the levels found in any

shallow upgradient well (WTB1, WT102A, WT112A, WT113A), which had non-detectable levels of arsenic in all sampling rounds. The maximum detection of *thallium* of 5.5 µg/L used in the CDA assessment exceeds the levels found in any shallow upgradient well (WTB1, WT102A, WT112A, WT113A), which had non-detectable levels of thallium in all sampling rounds.

Regarding *bis(2-ethylhexyl) phthalate* (BEHP), EPA risk assessment methodology (RAGS, Part A) does not recommend that organic contaminants be screened against background, as these compounds are not considered to be naturally occurring. Thus EPA believes that it is appropriate to include BEHP in the risk characterization. However, BEHP was not a driving chemical in the risk assessment, and contributed only minimally to the carcinogenic risk and the target non carcinogenic Hazard Index. Thus, deletion of BEHP in the CDA ground water risk assessment would not impact the risk estimates associated with this medium.

Regarding chromium and bis(2-ethyl)hexyl phthalate in ground water east of the landfill, the above comments regarding *bis(2-ethylhexyl) phthalate* (BEHP) also applies in the case of the assessment done using eastern ground water data. BEHP is not a naturally-occurring contaminant in the eastern ground water. The inclusion of *chromium* at 13.1 µg/L in the risk assessment was based on comparison with the average concentration in the background wells; chromium did not contribute to the overall potential non-carcinogenic risk from exposure to eastern ground water.

Comment Section V B, #1, page 64, RA #6: Bayer has commented that *"The revised Risk Assessment is based upon an incomplete and inaccurate quality assurance and data validation process."*

1. *Certain ground water samples cannot be considered representative samples, due to the lack of stabilization monitoring during well purging. The quantitative deficiencies in these samples pertain to all analytes, not just metals.*

EPA's Response: EPA does not agree with this comment. Monitoring wells were purged in accordance with the work plans and standard acceptable protocol. As noted in the comment, the samples collected from the direct push locations and the residential well samples were not purged using the same criteria as the monitoring wells. The direct push probe is in direct contact with the aquifer and does not require or support the prolonged purging performed at monitoring wells. The direct push locations were purged sufficiently long enough to ensure the water collected was representative of the formation from which it was drawn.

EPA disagrees that turbidity will create a significant effect on the VOC concentrations or that there was a persistent problem with equipment decontamination. VOCs generally have a tendency to partition to water rather than have an affinity for soil, as demonstrated by the low K_{ow} values. The VOCs detected are soluble in aqueous solutions at concentrations above the levels of concern. Additionally, the issue of turbidity impacting VOC results is immaterial because the presence of VOCs is site related, whether partitioned to the water or the soil. The results of the metals analysis was invalidated due to turbidity or lack of turbidity results because the particles suspended in a turbid sample are inherently metal. However, the presence of VOCs does not hold the potential to be due to natural background conditions in the same manner as metals which are the primary structure of the soil. The direct push equipment was thoroughly decontaminated

between sample locations. Moreover, the ground water purging provided additional rinsing of the equipment. Residential well samples were collected directly into the sample containers.

The analytical result from the different residential sampling events shows very good correlation among the target analytes. Based on the inorganic data, as well as the organic data, the results were reproducible. Without providing an extraction rate, comparison of purge times is somewhat immaterial.

Comment Section V B, #2, page 65, RA #7: Bayer has commented that *“Rinsate blanks do not appear to have been prepared and tested daily and source water blanks do not appear to have been prepared and tested during each event.”*

EPA’s Response: EPA does not agree with this comment. EPA agrees that the thallium sample result from WT116A in 1995 may be questionable because of the result of the rinsate sample. However, it is not valid to use the 1995 volatile organic blank contamination results from WT116A to discard the later (1996, May 2000, November 2000) detections of 1,2-dichloropropane. The (1998 and May 2000) sampling of the monitoring wells used disposable tubing, and the residential samples were collected directly to the sample containers which eliminated the requirement equipment rinsate blanks.

The quality control (QC) samples (trip blanks, source water, and equipment blanks) were collected in 2000 and are presented in the Data Quality Evaluations in Appendix I. The quality control samples have been used to qualify the data presented in Appendix H.

Comment Section V B, #3, page 67, RA #8: Bayer has commented that *“The sampling data reported in the SSCR do not consistently reflect the results from the data validation and quality assurance reviews. At a minimum, EPA should scrutinize the tables in the SSCR showing environmental sampling data, corroborate their accuracy, and assess the implications of the corrections on its conclusions regarding site-related COPCs, exposure concentrations, and site related risk measures.”*

EPA’s Response: EPA does not agree with this comment. The deficiencies noted by Bayer are generally invalid since the data described as in error has either been compared to inappropriate tables or reflect where errors were noted therein. Thus, the “impacted” tables were not used in the assessment of risk or in the development of conclusions.

The 1,2 dichloropropane result, reported in the sample collected from WT116A, that was qualified in the 1995 investigation, was detected several times in later (1996, May 2000, November 2000) sampling rounds without the qualification of results.

The purpose of the comments as they pertain to the phthalate data reported in 1995 is not clear. The data that were qualified due to blank contamination retained the “U” qualifier, but were used at the concentration at which they were detected rather than changing the reported values to one-half the quantitation limit.

As noted by Bayer, the antimony value reported from WT119A in 1998 was qualified as “not detected” because of blank contamination. The value (43.2 µg/L BJ) shown in the Appendix H table, *Historical Summary of Monitoring Wells Ground Water Detections*, is an error because the “U” qualifier is lacking. However, data from this table were not used in the risk assessment.

The iron and manganese values reported for WT112B in 1995 in the Appendix H table, *Historical Summary of Monitoring Wells Ground Water Detections*, are also in error. However, as stated in the previous paragraph the data presented in the table *Historical Summary of Monitoring Wells Ground Water Detections* was not used in the risk assessment. The values presented in the event table (Monitoring Well Ground Water Analytical Results September 1995) were used in the risk assessment.

IDEM provided an independent review of the inorganic data and prepared tables to support their validation. It is clearly noted on these tables that they should not be used as data report tables. The errors in these validation tables should not be misconstrued to represent actual values.

Comment Section V C., page 70, RA #9: Bayer has commented that “*The revised risk assessment is based upon an exposure assessment of indoor air inhalation that is flawed and grossly over-states exposure and risk.*”

EPA’s Response: EPA does not agree with this comment. EPA does acknowledge that their contractor used some outdated input values in the Andelman Model calculations in the risk assessment presented in the SSI/SCR, which may have resulted in some spurious risk estimates, even though the SSI/SCR text suggested that the estimates were done correctly. EPA Region 5 continues to support the use of standard methodologies in the preparation of human health risk assessment for Region 5 Superfund sites. EPA does not believe that these calculations change the conclusions of the risk assessment.

However, EPA does not support the arbitrary use of new, un-validated, methods from the literature to derive exposure point concentrations of contaminants in air, water or any other media, and generally relies in standard methodologies which have been evaluated by EPA’s research office. At present, no validated or verified models for use in deriving indoor air concentrations from showering and other household uses of ground water are available, and this creates model uncertainty in the risk assessment. The Andelman equations for deriving indoor air concentrations of VOCs from showering, bathing and other household uses of ground water, presented in Section 9.5.3.5 (page 9-16) of the SSI/SCR, represent the standard EPA methodology for this pathway of exposure. A discussion of the Andelman model and equations are presented in Section 3.1 of the EPA *Human Health Evaluation Manual, Part B* (OSWER Directive 9285.7-01B, December 13, 1991). Neither a discussions of the model, the parameter values nor any pertinent equations used in the Bayer assessment are presented in the assessment in Appendix C. Citation of the data from the Kerger et al. paper from the open literature in this assessment does not provide support for the use of such data from measurements of chloroform and trihalomethanes in indoor air at other locations or any rationale for why this data may be applicable to the volatilization of the contaminants found in the eastern area residential wells.

It should be further noted that the “transfer coefficient value” term derived by Bayer from the Andelman Equation includes a time factor (t = fraction of hours spent in showering or bathing), which makes these values site-specific values for the scenarios considered by EPA in the SSI/SCR. It also makes the SSI/SCR values different from the Unit Exposure Concentration (UEC) values derived in the Kerger paper, as these are average values that independent of the time duration. Thus, EPA does not consider it appropriate to substitute Unit Exposure Concentration values from the Kerger studies for the time-weighted values derived from the Andelman Equation.

Bayer has also suggested that the EPA model predicts that the transfer coefficient will be higher during bathing than during showering, which is not correct. It is the time interval over which the volatilization occurs which differs between the adult showering scenario and the child bathing scenario, and which has resulted in a higher air releases of VOCs during the bathing scenario. EPA considered that the child bathing activity would be substantially longer (the 90th percentile value of 45 minutes was used) than the 12 minute showering activity. EPA also considered that the bath time activities of a small child would include vigorous splashing, thus increasing the volatilization rate during this activity to a level similar to that in the showering scenario. This is not unreasonable; comparable water use transfer efficiencies (percent volatilization) as determined for radon by Richard and Gazelle (referenced by Andelman) were 63% for showering and 47% for normal bathing activities. Thus, EPA considered that the fraction volatilized (f_v) in the Andelman equation would be relatively similar during both adult showering and child bathing activities.

The bathrooms air concentrations from benzene in ground water (using 3 $\mu\text{g/L}$) from showering or bathing derived using the Andelman (1990) equations as reported in the Intake and Risk Calculation Spreadsheet in Appendix K of the SSI/SCR were reviewed. The derived air concentration of benzene for the combined 30-year child-adult exposure (using the adjusted exposure time of 0.31 hours) is 23.3 $\mu\text{g/m}^3$ ($2.3 \times 10^{-2} \text{ mg/m}^3$); the derived air concentration for the child scenario (using an exposure time of 0.75 hours) is 56.3 $\mu\text{g/m}^3$ ($5.6 \times 10^{-2} \text{ mg/m}^3$). These estimates do not represent unreasonable estimates of the benzene concentrations in air from these showering or bathing activities.

To further evaluate the representativeness of these estimates, EPA requested that the benzene air concentrations from adult showering be calculated using other available models being evaluated by EPA HQ contractors. The benzene air estimates from three models: Schaum and Andelman (used by Region 2), the Foster & Chrostowski (called IHEM) and McKone (CalTox) were employed for a 12 minute showering scenario using standard defaults for all other inputs; each model uses a different set of exposure variables so the models are not directly comparable. The calculated benzene air concentrations for the showering scenario, derived from each model, respectively, were 25 $\mu\text{g/m}^3$, 40 $\mu\text{g/m}^3$ and 90 $\mu\text{g/m}^3$. Thus it appears that the values used in the risk assessment in the SSI/SCR likely represent underestimates of the VOC air concentrations, as these newer methodologies would have yielded more conservative estimates of the indoor air concentration of VOCs released during the showering or bathing periods considered by EPA in the SSI/SCR risk assessment.

Nonetheless, EPA Region 5 does not arbitrarily incorporate data or methodology from the open literature into its standard methodology without further review and evaluation, or arbitrarily and

inconsistently apply such methodology at individual Superfund sites. However, a number of methodologies are now available to evaluate the indoor inhalation pathway, and EPA is presently evaluating these methodologies.

Comment Section V D., page 72, RA #10: Bayer has commented that *"The revised risk assessment is based upon the maximum detected concentrations in samples from certain monitoring wells, which ignores the sampling results collected from 1998 through 2000 that show lower, MCL-compliant concentrations."*

EPA's Response: EPA does not agree with this comment. The Region 5 guidance, *Future Residential Land Use Ground Water Exposure Point Concentrations for the Baseline Risk Assessment*, May 19, 1991, recommends that the contaminant concentration used to calculate the reasonable maximum exposure should be the concentration at the center of the contaminant plume, which is assumed to be the location presenting the highest risk to the receptor. When good monitoring well data exists, the exposure point concentration should be the upper 95% confidence limit on the arithmetic mean of the contaminant concentrations found in at least three monitoring wells located at the center of the aquifer's contaminant plume. However, the guidance further states that *"If good data identifying the center of the contaminant plume do not exist, modeling is not performed, and the collection of additional samples [from additional wells] is precluded, generally the well with the overall highest concentration of contaminants of concern should be used as the exposure point concentration. This is reasonable and does not constitute the worst case risk because it is highly likely that under these conditions, the true highest contaminant concentrations have not been detected in sampling."*

Regarding the bromide data, the continuing detections of bromide in ground water, supports the conclusion that the landfill is still contributing to ground water quality degradation, as indicated by the trends between WTM2/WT116A. Furthermore, this trend would be expected to continue because of the lack of source removal or control. In addition, if a conservative tracer, such as bromide, is still present in shallow ground water by the landfill at concentrations that are not much lower than those found 20 years ago, then the possibility of other contaminants that are not as mobile entering the ground water flow system is likely. This confirms the continued detections of organics and other contaminants that have been detected over time, and would likely continue into the future.

Comment Section V E., page 73, RA #11: Bayer has commented that *"A health risk assessment based upon a proper "site attribution" analysis, a complete and accurate data validation process, and a supportable exposure assessment of indoor air inhalation demonstrates that the Himco landfill does not pose any unacceptable health risk to nearby residents under any reasonable exposure and release scenario."*

EPA's Response: EPA does not agree with this comment, and has commented in-depth on this issue in the responses to Appendix C. In the risk assessment presented in the SSI/SCR, inhalation, ingestion and dermal absorption of both volatile and nonvolatile contaminants in monitoring well and geoprobe samples were considered. The revised health risk assessment provided by Bayer considered only inhalation of the volatile contaminants in residential wells.

Thus, critical exposures were not considered in the revised assessment. Additionally, the "modifications" to the SSI/SCR risk assessment suggested by Bayer have been discussed in-depth in the response to Section V. C above.

EPA also noted that, at present, no validated or verified models for use in deriving indoor air concentrations from showering and other household uses of ground water are available, and this creates model uncertainty in the risk assessment. EPA does not arbitrarily incorporate data or methodology from the open literature into its standard methodology without further review and evaluation, or arbitrarily and inconsistently apply such methodology at individual Superfund sites.

The Andelman equations for deriving indoor air concentrations of VOCs from showering, bathing and other household uses of ground water, presented in the SSI/SCR, represent the standard EPA methodology for this pathway of exposure, and was used in the SSI/SCR. However, a number of methodologies are now available to evaluate the indoor inhalation pathway, and EPA is presently evaluating these methodologies.

The revised assessment submitted by Bayer included a modified "transfer coefficient value" term derived by Bayer from the Andelman Equation. EPA does not consider it appropriate to substitute Unit Exposure Concentration values from the Kerger studies for the time-weighted values derived from the Andelman Equation. In the SSI/SCR assessment, the bathrooms air concentrations from benzene in ground water (using 3 µg/L) from showering or bathing derived using the Andelman (1990) equations provided a derived air concentration of benzene for the combined 30-year child-adult exposure (using the adjusted exposure time of 0.31 hours) of 23.3 µg/m³ (2.3×10^{-2} mg/m³) and a derived air concentration for the child scenario (using an exposure time of 0.75 hours) of 56.3 µg/m³ (5.6×10^{-2} mg/m³). EPA considers these estimates to represent reasonable estimates of the benzene concentrations in air from these showering or bathing activities.

To evaluate the representativeness of these estimates, EPA requested that the benzene air concentrations from adult showering be calculated by their contractors using other available models being evaluated by EPA. The benzene air estimates from three models: Schaum and Andelman (used by Region 2), the Foster & Chrostowski (called IHEM) and McKone (CalTox) were employed for a 12 minute showering scenario using standard defaults for all other inputs; each model uses a different set of exposure variables so the models are not directly comparable. The calculated benzene air concentrations for the showering scenario, derived from each model, respectively, were 25 µg/m³, 40 µg/m³ and 90 µg/m³.

Thus it appears that the values used in the risk assessment in the SSI/SCR likely represent underestimates of the VOC air concentrations, as the models suggested by Bayer would have yielded more conservative estimates of the indoor air concentration of VOCs released during the showering or bathing periods considered by EPA if all chemical contaminants in ground water had been considered in the assessment.

Comment Section VII B., page 84: Bayer has commented that "*The proposed active gas collection and treatment system is not warranted under CERCLA and the National Contingency Plan*" because there is no basis for concluding that methane or VOCs pose a health

threat via soil gas migration.

EPA's Response: EPA does not agree with this comment. EPA believes that the results of the soil gas sampling events demonstrate that methane, hydrogen sulfide and other VOCs are migrating from the landfill toward off-site residences to the south and east, and that the installation of an active landfill gas collection system will be required to control the migration of toxic and explosive gases that are presently migrating from the site for the reasons that follow:

Bayer's comments suggest that they did not understand the purpose of the soil gas sampling or how such results are to be used, even though Bayer submitted a Work Plan for this soil gas sampling in 1998. The Draft *Work Plan for Supplemental Site Characterization and Access Controls at the Himco Landfill NPL Site, Elkhart, Indiana*, prepared and submitted to EPA by QST Environmental at the request of the Himco PRP Group on January 6, 1998, presented a sampling strategy for such sampling. However, it is also clear that Bayer did not understand at that time that some VOCs (primarily the chlorinated hydrocarbons) have been demonstrated to migrate ahead of the methane plume. Thus, the Bayer/PRP Group efforts proposed to focus on methane, consistent with the comments provided here. The Bayer/PRP group never initiated this sampling, and EPA undertook this task, following the sampling scheme proposed in the Bayer/PRP Group Work Plan.

Regarding the soil gas sample results, EPA notes that the Work Plan stated: "Previous investigations to characterize soil gas constituents generated from the landfill have focused on the area within the boundaries of the landfill (Donahue, 1992; Quadrel, 1995). The purpose of this soil gas survey at the Himco Dump Site is to determine whether landfill generated constituents in the soil gas are migrating horizontally away from the landfill to the south and east, where residences are located, and to quantify the levels of those constituents which are migrating." "Initially, 15 locations will be sampled along the southern and eastern boundary of the landfill. These initial points will be located approximately 50 feet from the landfill boundary and at approximately 200-foot intervals. Constituents to be sampled include methane, hydrogen sulfide, and non-methane volatile organic compounds. Where the concentration of methane is detected at concentrations equal to or greater than 25% of the lower explosive limit (LEL) at an initial sampling location, then two additional locations will be sampled stepping away from the landfill boundary in order to evaluate the attenuation of the detected constituent(s). Each secondary location will be approximately 70 feet in a direction of 45 degrees either side of the initial sampling location such that the three locations form a triangle. With this sampling configuration, the secondary sampling points will fall on a line parallel to but 50 feet farther away from the landfill boundary. The secondary locations will also be sampled for methane, hydrogen sulfide, and non-methane volatile organic compounds."

The initial round of soil gas sampling conducted by EPA unexpectedly detected methane and VOCs in soil gas at highly elevated concentrations. The sampling was thus continued, in the stepwise manner described, during several distinct sampling events, until the VOC and methane concentrations in the soil gas samples were non-detect. Thus, the results at all off-site sampling locations on the perimeter of the sampled area would, by design, yield undetectable levels of methane or other VOCs.

The soil gas sampling was conducted in accordance with a decision made at a meeting at the Bayer facilities in which both Bayer and EPA agreed that the collection of soil gas samples would provide adequate documentation of a vapor migration pathway and that the collection of indoor air samples in homes would not be desirable or required for future decision-making at the site. At no time was it ever considered that the soil gas samples would be used to evaluate risks in ambient air. As previously stated, because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations in homes, the sampling points were not located near (within 10 feet) or underneath the residences. The 2002 EPA OSWER Draft *Guidance for Evaluating Vapor Intrusion to the Indoor Air Pathway From Groundwater and Soils* uses a three-tiered approach for assessing the vapor intrusion pathway, including primary and secondary screening of a site followed by a site-specific pathway assessment. The initial screening is based on the presence of contaminants in soil gas or ground water within 100 ft of a building designed for human occupancy. The document also discusses the potential for mobile “vapor clouds” (gas plumes) which are caused by methane carrier gas in the vicinity of landfills, and which have been known to travel 100s of feet in distant from the landfill site.

The Phase I and Phase II soil gas sampling conducted in areas both south and east of the Himco Dump site clearly shows that contaminants have been found in soil gas within 100 ft of residential structures. The concentrations of volatile contaminants detected in these soil gas samples suggest the potential for an intact vapor intrusion pathway. Sampling in the area to the east of the site has detected contaminants in soil gas samples taken in public areas (parkways) both west (between the landfill and the residential structures) and east of the structures, suggesting the homes are positioned to naturally intercept this vapor movement during periods when the ground is frozen and escape of volatile gases to ambient air is blocked.

Because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations, the data were not considered by EPA to be suitable for modeling volatile gas concentrations in indoor air. Therefore, the data were not used quantitatively to estimate risks to indoor air exposure. However, a qualitative discussion of the soil gas sampling results is presented in Chapter 5 of the SSI/SCR. Figures 5-1 through 5-4 present the contoured concentration data for the compound classes BTEX (benzene, toluene, ethyl benzene and xylene), chlorinated ethenes, chlorinated ethanes and vinyl chloride. All of the listed compound classes, as well as carbon disulfide, were found along the entire length of the southern off-site area of the landfill where sampling was performed. In one location south of the landfill, in the CDA, hydrogen sulfide levels were so great that the instrument detector was affected and sampling had to be halted.

Comment Section VII C., page 85: Bayer has commented that “*The contingent ground water remedy is not justified*” because (a) the RI data demonstrated that there is limited ground water contamination outside the landfill waste boundaries, and (b) since 1998, COPC concentrations in ground water samples from monitoring wells south of the landfill have been below MCLs.

EPA's Response: EPA does not agree with this comment. In addition, the comment is misleading, at best. (a) The contingent ground water remedy primarily addresses exposures to residents living to the East of the Himco Dump Site who presently use private residential wells as their source of potable water. Monitoring wells (WT114A/ WT114B) were not in place prior to the preparation of the 1993 RI; thus data on ground water contaminant migration to the eastern residential area was not available at the time of the RI. Since the RI, EPA has collected three rounds of data from monitoring wells WT114A and WT101A, two rounds of data from WT114B, WT101B and WT101C and data from a number of direct-push wells located along the eastern residential area, and samples from individual residential wells. These data from monitoring well sampling conducted in 1990/1991, 1995, 1996, 1998 and 2000 and data from three direct push sampling locations adjacent to the eastern residential area conducted in 2000 were available and were used in the SSI/SCR in the quantitative estimation of risk to the residents living to the east of the landfill. The estimated carcinogenic risk to the adult resident east of the Himco Dump Site from all exposure pathways is 5.8×10^{-4} . The cumulative non-carcinogenic risk to a child by all pathways of exposure is characterized by a Hazard Index of 29. All target organs HIs for non-cancer risks exceed unity ($HI > 1.0$) in this assessment. In addition, in those cases where the contaminant concentrations used in the quantitative risk assessment were less than those detected in the residential wells (for example, the use of 2 µg/L instead of 10 µg/L for the detection of 1,2-dichloropropane), the risks to the eastern residents have been underestimated in the quantitative risk assessment presented in the SSI/SCR.

(b) Regarding the comment that COPC concentrations in ground water samples from monitoring wells south of the landfill have been below MCLs since 1998, EPA notes that it is contaminant concentrations in monitoring wells east and southeast which is of primary concern. For all ground water sampling conducted prior to the 2000 ground water sampling round, a high detection limit (10 µg/L) was used in the sample analysis making it impossible to know if MCLs for volatile organic contaminants were exceeded in earlier sampling events. Further, EPA does not believe that attenuation of contaminant concentrations and compliance with drinking water MCLs can be based on the single sampling round in 2000. Most volatile organic contaminants of interest in drinking water have MCLs well below 10 µg/L, with some (e.g., vinyl chloride and benzo(a)pyrene) having MCLs at 2 µg/L and 0.2 µg/L, respectively; thus, it is unlikely that these would have been detected in the 1998 and earlier sampling events. In addition to concerns above, arsenic levels exceeded MCL values in monitoring well WT114A, east of the landfill, in 1995, and 1,2-dichloropropane was found at levels which are 2 times the MCL in a private residential well during three sampling periods. EPA does not consider it appropriate to speculate when risks to human health are concerned, and thus considers it appropriate to look at all relevant data when developing potential site risk estimates. Finally, the very high levels of bromide detected in monitoring wells WT101A, WT101B and WT101C in 2000 suggest that contaminant releases to ground water have not significantly attenuated.

Comment Section VII D., page 85: Bayer has commented that "*The excavation of construction debris and rubble from private residential parcels south of the landfill is not warranted under CERCLA*" because surface soils in the construction debris area do not pose unacceptable a cancer or non-cancer threat to current on-site residents, and that cancer risks to a hypothetical future resident on parcels that are currently nonresidential is only slightly greater than

10^{-4} (1.5×10^{-4}).

EPA's Response: EPA does not agree with this comment. Bayer's comment addresses parcels that are currently used for residential land uses only. EPA has evaluated the cancer risks for a combined child/adult resident and for a construction worker and the non-cancer risks (HIs) for a child resident and for a construction worker at all land parcels, both residential and undeveloped commercial/industrial parcels, in accord with the assumptions stated previously, that it is important to distinguish between the "site" and the "landfill." There is nothing that renders it unlikely that future homes or high-density housing may be built on the site south of the landfill in the future. There are currently homes along County Road 10 south of the landfill. The contaminated area between County Road 10 and the landfill, including the area known as the construction debris area (CDA) is obvious a location where future housing might be constructed. Institutional controls such as zoning prohibitions, fencing, posting of sign and other restrictions cannot ensure that the site will never be used in the future for this purpose. Since there is some likelihood of some kind of future use for land that is situated in close proximity to the City of Elkhart, and since construction of housing and industrial development has taken place on other landfill sites, it is appropriate for the risk assessment to evaluate such exposures and for risk management decisions to take this information into account in making sites remedial decisions.

Second, not all land parcels, either residential or commercial, were sampled. Soil samples were obtained from parcels D, F, M, O, P and S only. No soil samples were collected from land parcels N, Q, R, and T. The risks from direct contact to soils in the latter parcels were determined using geostatistical methods to project contaminant concentrations in these parcels, and were based the modeling of two constituents only. Even in those parcels that were sampled, sampling was sparse. The CDA soils have not been fully characterized, and it is highly likely that not all CDA soil contaminants were identified nor were the highest contaminant concentrations determined. The risk estimates for the CDA soils are highly uncertain. However, it was never the intention to fully characterize the CDA soils in these screening samples. Indeed, Bayer had previously submitted, through its contractors, a Work Plan for the sampling of the CDA for the purpose of determining if the soil contained any constituents that present a risk to human health; EPA, through its contractor, completed this task. The screening sampling was to indicate a potential for concern in CDA soils.....which has been done.

When all receptor populations are considered, the cancer risk to the resident from exposure to CDA soil in all parcels was estimated to range from 1.9×10^{-5} (in un-sampled parcel N) to 1.5×10^{-4} , with the risk at or exceeding 10^{-4} in two parcels (F and S). The cancer risk range for a construction worker from exposure to CDA soils was $> 10^{-6}$ to 4.6×10^{-6} . The non-cancer risk (HI) to the residential child due to exposure to CDA soil was estimated to range from 0.11 (in un-sampled parcel N) to 4.5 (in parcel F due to arsenic and the non-cancer effects of benzo-a-pyrene). The non-cancer risk (HI) to a construction worker in parcel F was estimated at 1.3; no other parcel had an unacceptable non-cancer risk (HI or HQ > 1.0). Thus it is clear that both cancer and non-cancer estimated risks exceed an unacceptable risk level at some parcels in the CDA. And as previously stated, sampling of the parcels was sparse and not all land parcels were sampled, so there is great uncertainty as to whether these estimates are inclusive of all CDA soil constituents or are representing the maximum risks that might be expected from exposure to the CDA soils.

The conclusion from the CDA screening sampling is that contaminants may be present anywhere in the CDA soils at concentrations that could exceed risk levels. This is true because not all parcels were sampled and those that were had very sparse sampling. Thus, a final conclusion of the CDA analysis, as stated in Chapter 11 of the SSI/SCR, is that *"CDA soils have demonstrated a potential risk from repeated exposure and should be removed."*

Comment Section VII E., page 86: Bayer has commented that *"The excavation of lead-containing soil from the construction debris area south of the landfill is not warranted under CERCLA"* because lead was detected at a concentration greater than 400 ppm in only one sample out of 47 samples, in parcel F, which is not a residential property. Bayer has further commented that EPA guidance suggests that exceedences of the lead screening level would trigger the use of further evaluation, and perhaps the use of the Integrated Exposure Uptake Biokinetic (IEUBK) Model to set site-specific remediation goals.

EPA's Response: EPA does not agree with this comment. EPA reported that lead was detected above the residential screening level in land parcel F in one surface soil sample at an estimated concentration of 695 mg/kg. Lead was also detected in other surface, near surface and subsurface soil samples at land parcels F, D, S and O. However, no soil samples were collected at Land Parcels N, R, Q and T. Although the lead concentrations detected were below the screening level, the concentrations represent lead concentrations in unsieved samples. It has been determined that lead concentrations in soil generally increase with decreasing particle size. Thus, concentration factors of 1.4 and greater for the fine fraction of soil that most readily sticks to children's hands (the ingestible fraction as determined by sieving of the soil) been reported at Superfund sites. Therefore, use of the total soil concentrations likely underestimates the overall child health risk to lead in the identified parcels.

However, not all parcels were sampled. The conclusion from the CDA screening sampling is that any contaminants, including lead, may be present anywhere in the CDA soils at concentrations that could exceed risk levels. EPA has also considered that construction debris is likely to contain lead-based paint, which is easily released to soil and is highly bioavailable should this soil be ingested by children or adults of childbearing age.

EPA believes that it is appropriate to assess lead in the CDA soil from all land parcels because this is consistent with the exposure scenarios developed for other CDA soil contaminants. Regarding the suggestion that the IEUBK Model should have been used to assess risk and develop site-specific remediation goals for lead in the CDA, EPA noted that there are no site-specific data to adjust default input values to the IEUBK Model. Thus, a reasonable cleanup goal for future residential land use or any land uses where children are present (e.g., parks, playgrounds, school areas) is 400 ppm. However, the use of the higher ingestion rates required for a construction worker (or any outdoor worker) exposed to lead-contaminants using the EPA Adult Lead Model (ALM) would also result in the cleanup of lead in the fine-soil fraction below the levels detected in the CDA soils. A residential soil lead goal of 400 ppm would be expected to be protective for residential children, construction workers, residential gardeners, and other workers would have significant contact with the CDA soils.

Comment Section VII F., page 87: Bayer has commented that *"The extension of the municipal water supply to certain residences east of the landfill is not warranted under CERCLA"* because (a) Bayer does not believe that the ground water contamination east of the landfill is related to the Himco landfill and (b) that it does not present an unacceptable risk to those residents with impacted drinking water. Himco has also suggested that (c) EPA did not prepare a health risk assessment based on sampling results from residential wells located east of the landfill, because EPA, presumably recognizes that the ground water quality in these wells does not pose an unacceptable health risk.

EPA's Response: EPA does not agree with this comment. (a) EPA has previously responded that the RI Report characterizes the hydrogeology and groundwater flow at two different scales, from a regional standpoint, and from a much smaller site-specific standpoint. A regional hydrologic study was performed by the USGS between 1978 and 1981, the results which were incorporated into the RI Report. This regional hydrologic study encompassed an area of approximately 120 square miles. A regional contour map of groundwater flow in the unconfined aquifer from the USGS study was presented in the RI Report, showing flow is generally to the south toward the St. Joseph River. The USGS did not differentiate between water levels obtained from monitoring wells screened across the water table or at depth within the unconfined aquifer as was performed in the SSI/SCR. Given the scale of the USGS investigation, this would probably not have made much difference in the interpreted ground water flow direction as presented. The RI and the SSI/SCR present groundwater flow interpretations based on a network of monitoring wells from a much smaller area of approximately one square mile. Furthermore, the interpreted ground water flow directions presented in the SSI/SCR were segregated by depth of the screen interval of the monitoring wells based on the fact that vertical gradients were noted in many of the nested monitoring well clusters. Even when comparing results from vastly different scales and monitoring networks, one can see that the site-specific results closely match those presented in the regional study for the area immediately surrounding the Himco Dump Site. All studies show that there is a south to southeast ground water flow direction around and beneath the Himco Dump Site. This implies that on a local basis (on the east side of the Himco Dump Site), there is an easterly component, albeit small, to the ground water flow direction. The EPA has never maintained that ground water flows strictly in an eastward fashion.

Furthermore, Bayer has inferred that the shape of the bromide contours may be used as an indication of ground water flow direction. A comparison of Figures 9 and 10 of the U.S. Geological Survey Water-Resources Investigations Report 91-4053, which shows the areal distributions of maximum dissolved bromide concentrations for 1980 and 1982 respectively, clearly shows dissolved bromide migrating toward the east to what is identified as an area of industrial pumping (the Bayer Corporation). This is clear evidence that an eastward component of ground water flow has existed in the vicinity of the Himco Dump Site.

(b)) EPA has repeatedly responded that EPA's decision not to conduct a quantitative risk assessment using the residential well data was based on the criteria that were developed for use of ground water data in a quantitative risk assessment, as discussed in detail in chapter 4.0 of the SSI/SCR. In Section 4.2.7 of the SSI/SCR, EPA has explained that *"The residential well analytical data, collected during the March, April/May and November 2000 sampling events,*

meets the five criteria established in Section 4.1, and are usable in a quantitative manner and to qualitatively support the risk assessment which follows in this report with the exception of the metals/cyanide data collected during the March and April/May 2000 and the emerging contaminants data. The metals data obtained from residential water well samples collected during the March and April/May 2000 sampling events are unusable in a quantitative manner or to qualitatively support the risk assessment as no turbidity measurements were obtained during the sampling process."

However, the data from monitoring well sampling conducted in 1990/1991, 1995, 1996, 1998 and 2000 and data from three direct push sampling locations adjacent to the eastern residential area conducted in 2000 were available and were used in the SSI/SCR in the quantitative estimation of risk to the residents living to the east of the landfill. The estimated carcinogenic risk to the adult resident east of the Himco Dump Site from all exposure pathways is 5.8×10^{-4} . The cumulative non-carcinogenic risk to a child by all pathways of exposure is characterized by a HI of 29. All target organs HIs for non-cancer risks exceed unity ($HI > 1.0$) in this assessment. In addition, in those cases where the contaminant concentrations used in the quantitative risk assessment were less than those detected in the residential wells (for example, the use of 2 µg/L instead of 10 µg/L for the detection of 1,2-dichloropropane), the risks to the eastern residents have been underestimated in the quantitative risk assessment presented in the SSI/SCR.

(c) In response to the alternate human health risk assessment for the eastern residential exposure to ground water submitted by Bayer in Appendix C, EPA summarized the contaminant levels found in the eastern residential well water (at any well at any depth) and compared them to the trigger levels for several pathways from exposure to ground water, as presented in the 2002 Region IX PRG Tables. The resulting comparison risks table in Appendix C presents EPA's summary of relevant information regarding these contaminant concentrations and relevant risk levels. Using this simple comparison method, EPA has clearly demonstrated that both the cancer risk estimates and the non-cancer Hazard Index for residents exposed to water from eastern area residential wells in some locations exceed the risk estimates submitted by Bayer by an order of magnitude and exceed EPA's level for developing remedial response actions. The difference in risk estimate is primarily due to inclusion of inhalation exposure to all volatile organic contaminants (Bayer did not include inhalation exposure of the most volatile contaminants in their assessment) and inclusion of metal contaminants (primarily arsenic). EPA's comparisons did not include the dermal pathway, which Bayer has suggested is minimal but included in their risk characterization. This risk estimate is not overly conservative as reasonable methodology and parameter inputs were considered in the derivation, and maximum values for contaminant concentrations used in the comparison were actual concentrations found in the several wells which contained the risk-driving chemicals. These estimates from summing the contaminant concentration comparisons with risk values using standardized EPA methodologies and relevant toxicity values are similar to the risk estimates that EPA would have developed if such a task had been undertaken in the SSI/SCR using this data set.

APPENDIX C

Comments Appendix C, Section III. : Bayer has presented, in Appendix C, a "Human Health Risk Assessment Regarding Ground Water Use," which focuses on the use of ground

water from certain residential wells located east of the Himco Superfund site. The appendix describes and documents methods, data and assumptions employed in this assessment. The risk assessment results are discussed in Sections IV, V, and VI of the Comment package.

EPA's Response: EPA does not agree with the approach taken by Bayer in developing a separate risk assessment for use of ground water for residents located east of the Himco Dump site that is based on residential well data. As EPA has previously commented in the response to Section IV. H, ROD #14, and in the response to Section III H, GW #8, EPA's decision not to conduct a quantitative risk assessment of this scope is based on the criteria for use of ground water data in a quantitative risk assessment, as discussed in detail in chapter 4.0 of the SSI/SCR. In Section 4.2.7, EPA has explained that *"The residential well analytical data, collected during the March, April/May and November 2000 sampling events, meets the five criteria established in Section 4.1, and are usable in a quantitative manner and to qualitatively support the risk assessment which follows in this report with the exception of the metals/cyanide data collected during the March and April/May 2000 and the emerging contaminants data. The metals data obtained from residential water well samples collected during the March and April/May 2000 sampling events are unusable in a quantitative manner or to qualitatively support the risk assessment as no turbidity measurements were obtained during the sampling process."* [EPA's emphasis.]

Thus, EPA does not believe that there would be any benefit in conducting a partial risk assessment using only the VOC contaminants in ground water. The inability to develop risk estimates using all the ground water contaminants and all pathways of exposure to ground water makes such an exercise meaningless, if not undesirable. However, data from monitoring well sampling conducted in 1990/1991, 1995, 1996, 1998 and 2000 and data from three direct push sampling locations adjacent to the eastern residential area conducted in 2000 were available and were used in the SSI/SCR in the quantitative estimation of risk to the residents living to the east of the landfill. The estimated carcinogenic risk to the adult resident east of the Himco Dump Site from all exposure pathways is 5.8×10^{-4} . The cumulative non-carcinogenic risk to a child by all pathways of exposure is characterized by a HI of 29. All target organs HIs for non-cancer risks exceed unity ($HI > 1.0$) in this assessment. In addition, in those cases where the contaminant concentrations used in the quantitative risk assessment were less than those detected in the residential wells (for example, the use of 2 µg/L instead of 10 µg/L for the detection of 1,2-dichloropropane), the risks to the eastern residents have been underestimated in the quantitative risk assessment presented in the SSI/SCR. Again, EPA does not believe that there is value in the type of risk assessment conducted by Bayer in Appendix C.

Comments Appendix C, Section III, A: Bayer has commented that EPA has projected that inhalation of indoor air contributes most of the exposure associated with the use of contaminated ground water in a household, even more than direct ingestion. Bayer has further commented that this outcome is due to the use of flawed and unverified models to predict indoor air concentrations during showering and other household uses of water. Bayer then discussed in the section on Indoor Air Exposure Concentrations During Showering/Bathing, a paper by Kerger et al. published in 2000 (*Risk Analysis* 20:637-650), which they then arbitrarily use as an adjustment to EPA standard methodology (Andelman, 1990) to revise derived concentrations of

VOCs in indoor air from showering and bathing activities.

EPA's Response: EPA does not agree with Bayer's comments or approach. In the risk assessment presented in the SSI/SCR, inhalation, ingestion and dermal absorption of both volatile and non-volatile contaminants in monitoring well and geoprobe samples were considered. This assessment by Bayer considers only inhalation of the volatile contaminants in residential wells.

At present, no validated or verified models for use in deriving indoor air concentrations from showering and other household uses of ground water are available, and this creates model uncertainty in the risk assessment. The Andelman equations for deriving indoor air concentrations of VOCs from showering, bathing and other household uses of ground water, presented in Section 9.5.3.5 (page 9-16) of the SSI/SCR, represent the standard EPA methodology for this pathway of exposure. A discussion of the Andelman model and equations are presented in Section 3.1 of the EPA *Human Health Evaluation Manual, Part B* (OSWER Directive 9285.7-01B, December 13, 1991). Neither a discussion of the model, the parameter values nor any pertinent equations used in the Bayer assessment are presented in the assessment in Appendix C. Citation of the data from the Kerger et al. paper from the open literature in this assessment does not provide support for the use of such data from measurements of chloroform and trihalomethanes in indoor air at other locations or any rationale for why this data may be applicable to the volatilization of the contaminants found in the eastern area residential wells.

It should be further noted that the "transfer coefficient value" term derived by Bayer from the Andelman Equation includes a time factor (t = fractions of hours spent in showering or bathing), which makes these values site-specific values for the scenarios considered by EPA in the SSI/SCR. It also makes the SSI/SCR values different from the Unit Exposure Concentration (UEC) values derived in the Kerger paper, as these are average values that independent of the time duration. Thus, EPA does not consider it appropriate to substitute UEC values from the Kerger studies for the time-weighted values derived from the Andelman Equation.

Bayer has also suggested that the EPA model predicts that the transfer coefficient will be higher during bathing than during showering, which is not correct. It is the time interval over which the volatilization occurs which differs between the adult showering scenario and the child bathing scenario, and which has resulted in a higher air releases of VOCs during the bathing scenario. EPA considered that the child bathing activity would be substantially longer (the 90th percentile value of 45 minutes was used) than the 12 minute showering activity. EPA also considered that the bath time activities of a small child would include vigorous splashing, thus increasing the volatilization rate during this activity to a level similar to that in the showering scenario. This is not unreasonable; comparable water use transfer efficiencies (percent volatilization) as determined for radon by Richard and Gazelle (referenced by Andelman) were 63% for showering and 47% for normal bathing activities. Thus, EPA considered that the fraction volatilized (f_v) in the Andelman equation would be relatively similar during both adult showering and child bathing activities.

The bathroom air concentrations from benzene in ground water (using 3 µg/L) from showering or bathing derived using the Andelman (1990) equations as reported in the Intake and Risk Calculation Spreadsheet in Appendix K of the SSI/SCR were reviewed. The derived air

concentration of benzene for the combined 30-year child-adult exposure (using the adjusted exposure time of 0.31 hours) is 23.3 $\mu\text{g}/\text{m}^3$ ($2.3 \times 10^{-2} \text{ mg}/\text{m}^3$); the derived air concentration for the child scenario (using an exposure time of 0.75 hours) is 56.3 $\mu\text{g}/\text{m}^3$ ($5.6 \times 10^{-2} \text{ mg}/\text{m}^3$). EPA considers these estimates to represent reasonable estimates of the benzene concentrations in air from these showering or bathing activities. To evaluate the representativeness of these estimates, EPA requested that the benzene air concentrations from adult showering be calculated using other available models being evaluated by EPA. The benzene air estimates from three models: Schaum and Andelman (used by Region 2), the Foster & Chrostowski (called IHEM) and McKone (CalTox) were employed for a 12 minute showering scenario using standard defaults for all other inputs; each model uses a different set of exposure variables so the models are not directly comparable. The calculated benzene air concentrations for the showering scenario, derived from each model, respectively, were 25 $\mu\text{g}/\text{m}^3$, 40 $\mu\text{g}/\text{m}^3$ and 90 $\mu\text{g}/\text{m}^3$. Thus it appears that the values used in the risk assessment in the SSI/SCR likely represent underestimates of the VOC air concentrations, as the models suggested by Bayer would have yielded more conservative estimates of the indoor air concentration of VOCs released during the showering or bathing periods considered by EPA in the SSI/SCR risk assessment.

Nonetheless, EPA Region 5 does not arbitrarily incorporate data or methodology from the open literature into its standard methodology without further review and evaluation, or arbitrarily and inconsistently apply such methodology at individual Superfund sites. However, a number of methodologies are now available to evaluate the indoor inhalation pathway, and EPA is presently evaluating these methodologies. If Bayer believes that the Kerger et al. paper represents an enhancement to the present EPA methodology, Region 5 encourages Bayer to request a review of this methodology by the EPA NCEA Exposure Assessment Group, so that consistent methodology can be developed for use in all Superfund risk assessments.

Comments Appendix C, Section III. B: Bayer has commented that EPA's model of volatilization during other household uses is flawed. Bayer presented a discussion on Indoor Household Air Exposure Concentrations, in which older data from two Wallace et al. literature paper from 1984 and 19986 is substituted for the Andelman model (1990) for household uses of ground water used by EPA.

EPA's Response: EPA does not agree with Bayer's comments or approach. Of all the domestic water uses, showering and bathing activities are considered to dominate the cumulative exposure from ground water uses; thus, all water uses were evaluated in the SSI/SCR risk assessment. EPA agrees that the Andelman models, which are the most widely used EPA models, are only simple models, and do not consider mass transfer differences. EPA is presently evaluating several available methodologies for use in evaluating this pathway of exposure. However, the Andelman model is widely used in Superfund site assessments, and EPA does not consider it appropriate to simply substitute the average values from measurements reported by Wallace et al. in the open literature for chloroform in different parts of the U.S. for volatilization of other contaminants from wells east of the Himco Dump site. EPA also notes that the chloroform transfer coefficients vary widely, depending on the location (and likely other factors). EPA notes the average value suggested by Bayer for use in this assessment ($0.05 \text{ L}/\text{m}^3$) is approximately 1/5 the value listed for winter measurements taken in cold climates (New Jersey),

which is more similar to the Elkhart, Indiana climate than the California and North Carolina measurements that dominant the table presented in the Bayer assessment. Thus, EPA does not agree with the arbitrary use of the average transfer coefficient for chloroform from the Wallace studies in the assessment presented in Appendix C.

Comments Appendix C, Section III, C: Bayer has commented in a section on Breathing Rates that the breathing rates and body weights recommended by EPA are different from the 20 m³/day inhalation rate commonly used in Superfund risk assessments. Bayer has further commented that values recommended in EPA's 1997 Exposure Factors Handbook (EFH) represent more appropriate values for breathing rate and body weight.

EPA's Response: EPA does not agree with Bayer's comments. EPA does agree that the inhalation and body weight data used in the risk assessment appear to represent an attempt at a scholarly approach to inhalation risk assessment rather than the use of more conventional defaults. In the 1992 BRA, a breathing rate of 20 m³/day was used in both the child and adult resident scenarios. EPA does not consider either approach to be ideal. EPA had advised its contractors that EPA prefers the direct use of inhalation unit risk values for cancer and reference concentrations (RfCs) for non-cancer effects, which are based on an adult inhalation rate of 20 m³/day and an adult body weight of 70 kg; the modifying factors used to account for intra-species differences and sensitive sub-populations (the child and obese individuals) in the derivation of the toxicity values is considered to subsume the differences in inhalation rate per body weight illustrated by Bayer in Table C-3. Thus EPA considers that the exposure point air concentration, adjusted for exposure time, exposure frequency, exposure duration and the averaging time, can be directly compared to the IRIS inhalation toxicity values to derive the cancer and non-cancer risk estimates, without further consideration of the inhalation rate or body weight differences. However, because RfCs and inhalation unit risk values were not available for all contaminants when this project was undertaken, a consistent methodology was used in this assessment.

Comments Appendix C, Section IV, A: Bayer has commented in a section on Chemicals of Potential Concern that thirteen residential wells east of the Himco Dump site were sampled from one to three times during the 2000 calendar year. Bayer then provides summary statistics for the detected contaminants found in these sampling rounds and comments that suggest that these contaminant detections are insignificant.

EPA's Response: EPA does not agree with Bayer's comments. As EPA has previously commented in the response to Section III above, EPA's decision not to conduct a quantitative risk assessment using the residential well data was based on the criteria that were developed for use of ground water data in a quantitative risk assessment, as discussed in detail in chapter 4.0 of the SSI/SCR. In Section 4.2.7 of the SSI/SCR, EPA has explained that "*The residential well analytical data, collected during the March, April/May and November 2000 sampling events, meets the five criteria established in Section 4.1, and are usable in a quantitative manner and to qualitatively support the risk assessment which follows in this report with the exception of the metals/cyanide data collected during the March and April/May 2000 and the emerging contaminants data. The metals data obtained from residential water well samples collected during the March and April/May 2000 sampling events are unusable in a quantitative manner or*

to qualitatively support the risk assessment as no turbidity measurements were obtained during the sampling process." [EPA's emphasis.]

Bayer has commented that only eight of the 40 target VOCs were detected in any of the 25 samples collected, with five of the eight being found in only one or two of the sampled wells. However, Bayer has failed to disclose that *benzene* was found in two of the 13 residential wells sampled, *1,1-dichloroethane* was found in six of 13, *1,2-dichloroethane* was found in three of 13, *cis-dichloroethene* was found in five of 13, *1, 2-dichloropropane* was found in one of 13 at levels which are two times the primary Maximum Contaminant Level (MCL) for drinking water in every sampling period (3), *methylene chloride* was found in one of 13, and *vinyl chloride* was found in two of 13 residential wells sampled. That contaminants were not found in every residential well sampled is due to EPA's sampling strategy, which sought to determine if the ground water being used by residents in the area east of the Himco Dump was contaminated and to collect information on the horizontal and vertical bounds of contamination during this sampling period. However, not all residential wells in the area of contamination were sampled, and well depth information was not available for all residential wells sampled. All contaminants, with the exception of *vinyl chloride*, were found in the samples taken from the monitoring wells (WT101A, WT114A, WT114B) or the direct push well locations (GP16, GP101, GP114) located between the Himco Dump site and the residential wells, suggesting migration from the landfill. *Trichloroethene*, which degrades to the di-chlorinated compounds and the more toxic *vinyl chloride*, was found in one direct push sample. *Vinyl chloride* was also found in onsite well WT116A, as were all other contaminants detected in the residential wells.

Bayer has commented that *arsenic* was not found in residential wells at concentrations greater than background levels, and cites the maximum value of 24.6 µg/L found in Elkhart County as a reasonable background level. [EPA also notes that Bayer cites the maximum value of 14 µg/L found in Elkhart County as a reasonable background level in Section V. A., page C-16 of this comment package!] However, EPA also notes that the arsenic levels were less than the 2 µg/L detection limit in nine of the 13 residential wells sampled, suggesting that the background level of arsenic in ground water in the area east of the Himco Dump site is considerably lower than either maximum concentration cited for other parts of the county. Moreover, in the 1995 sampling, during which arsenic levels of 23.3 and 18.5 µg/L were detected in WT114A and WT114B, arsenic levels did not exceed 4.8 µg/L (maximum; WT102B) in any background well. In addition, arsenic levels in the 10 monitoring wells available to establish background levels in the 2000 Spring sampling event (WTB1, WTB3, WTB4, WT102A, WT102B, WT102C, WT112A, WT112B, WT113A and WT113B) did not exceed a maximum of 6 µg/L (WT102B). However, EPA has already discussed that some 2000 data may not be accurate, and EPA chose not to develop risk estimates using the residential well metals data. However, it is clear that elevated levels of arsenic were consistently found in monitoring wells (WT 114A, WT114B) located east of the Himco Dump site.

Bayer has commented that the levels of *iron* in the residential well samples are not elevated relative to the maximum detected background concentration (17,200 µg/L) detected in Elkhart County. *Iron* levels between 5,000 µg/L and 6,000 µg/L were found in three of 13 residential wells sampled; the recommended daily intake of iron for infants is 6,000 µg/day. Young children

may consume as much as one Liter of water a day from drinking water and in formula and food prepared with the water. Iron levels in wells available to characterize background in the 2000 Spring sampling event ranged from 23.3 µg/L - 2210 µg/L, with the maximum level being detected in one very deep well in the series (WT102C), suggesting that the iron levels in these residential wells are significantly greater than the local background levels. The National Academies of Science recommends that drinking water should not be the primary source of this mineral for infants, and that excess intakes can cause abdominal pain, nausea and vomiting. Receptors with hereditary hemochromatosis, a common inherited single-gene disorder, should also avoid ingestion of water with elevated levels of iron.

Bayer has commented that the levels of *manganese* in the residential well samples are not elevated relative to the maximum detected background concentration (1,870 µg/L) detected in Elkhart County. The level (1,560 µg/L - 1,880 µg/L) of *manganese* found in one of 13 wells is approximately two times the non-cancer trigger level for manganese in drinking water (880 µg/L). Manganese levels in wells available to characterize background in the 2000 Spring sampling event ranged from 3.1 µg/L - 356 µg/L, with level greater than 100 µg/L detected in only two wells in the series (WTB3, WTB4).

EPA also found that *calcium* levels between 100,000 µg/L and 205,000 µg/L were found in five of 13 residential wells; the maximum calcium intake for infants under the age of one year is 60,000 µg/day, with no intake from water recommended. Thus to prevent milk alkali syndrome and gastrointestinal discomfort, the water at these residences should not be given to infants.

The levels of *sodium* found in five of 13 wells were between 44,400 µg/L - 126,000 µg/L, suggesting that the water should not be used by those on a low sodium diet (whose water should not contain more than 20,000 µg/L). Excessive levels of sodium in residential wells to the south of the Himco Dump site resulted the distribution of municipal water to this area in the past.

Comments Appendix C, Section IV. B: Bayer has commented in a section on Exposure Point Concentrations (EPC) that because the EPC value used in their assessments was the maximum concentrations from any of the 25 residential well samples, the EPC is likely to overestimate the exposure and risk to residents living to the East of the Himco Dump site.

EPA's Response: EPA does not agree with this comment. It is not known whether the maximum concentrations detected in the 2000 sampling round represent the maximum concentrations that have been in these residential wells in the past or whether they are the maximum concentrations that can be expected in the future. However, these data are the only data presently available to demonstrate exposure to residents living to the east of the Himco Dump from ground water contaminants migrating from the site.

Bayer has also commented that RAGS allows for use of the upper-bound estimates of the average concentrations in the human health risk assessment. Such an approach might be reasonable when applied to the soil contaminant concentration within an individual residential yard, and may be applicable to ground water use under some conditions. However, as Bayer has clearly demonstrated themselves, the ground water contaminant concentrations in the area are highly

variable, perhaps due to the varying depths of residential wells, the presence of local plumes or isolated ground water pools, and other factors. The eastern area residents are not presently being equally exposed to ground water contaminants, although that could change with installation of new wells, changes in the ground water table depth, flow direction or flow rates. Thus EPA does not believe that it is reasonable or correct to assume that any resident is exposed to the average or upper-bound estimates of the average contaminant levels detected in the individual residential wells. This would greatly overestimate the risk for some residents and greatly underestimate the risks for others.

Comments Appendix C, Section IV. C: Bayer has commented in a section on Toxicological Assessment that EPA assumed both dermal exposure and inhalation exposure to VOCs in water, without reduction of the dermal exposure due to volatilization. Thus Bayer has commented that EPA's methodology has overestimated the dermal exposure, dermal dose and risks to four VOC were not considered in the quantitative risk assessment presented in Appendix C.

EPA's Response: EPA does not agree entirely with this comment. While EPA does not support "double counting" in the calculation of risk estimates, EPA also notes that the use of the transfer coefficients for the VOC contaminants, discussed in the response to Section III B above, limits the volatilization of the contaminants in the development of the air contaminant concentrations. Thus, a smaller portion of the contaminant is considered to be released into the air, and a greater fraction remains available in water for dermal absorption. The EPA dermal guidance manual contains a table to guide users as to whether there is a need to consider the dermal absorption pathway for the various VOCs. In general, EPA recommends that the fraction volatilized from water not be considered in the concentration available for exposure in the quantitative evaluation of the dermal pathway. But, as Bayer has suggested, for most chemicals the dermal pathway provides a minimal contribution to the overall risk estimates from ground water exposure. However, since the Bayer risk assessment methodology seriously limits the volatilization of the VOCs to the air exposure medium, it would seem more critical to include a dermal assessment for VOCs in their risk assessment, so that the total risk from the ground water exposure would not be underestimated.

Comments Appendix C, Section IV. D: Bayer has commented in a section on Risk Characterization that the cumulative lifetime cancer risk to residents using the eastern residential wells as a source of potable water from the detected VOCs in this water is 3.4×10^{-5} and that the non-carcinogenic risk is reflected by a Hazard Index less than 1.0, based on a human health risk assessment they submitted which is based on exposure to the VOCs only. Exposures to metallic compounds in ground water were not included in the assessment, and literature values for national average chloroform transfer coefficients from the literature were used to derive air exposure concentrations. Bayer has stated that they believe that the health risk assessment is conservative.

EPA's Response: EPA does not agree with Bayer's comments, as reflected in the above responses to the individual sections in Appendix A where these issues are discussed, or with the health risk assessment prepared for the eastern residential wells. EPA believes that the health risk assessment for the eastern residential well water exposures submitted by Bayer seriously under

estimates the risks to residents using this water as a potable water source.

EPA's has responded, in Section IV. A. Above, that EPA's decision not to conduct a quantitative risk assessment using the eastern residential well data was based on the criteria that were developed for use of ground water data in a quantitative risk assessment, as discussed in detail in Chapter 4.0 of the SSI/SCR, in which EPA explained that the metals data obtained from residential water well samples collected during the March and April/May 2000 sampling events are unusable in a quantitative manner or to qualitatively support the risk assessment as no turbidity measurements were obtained during the sampling process. Only two wells were sampled in the November 2000 sampling event. Thus, EPA did not undertake the health assessment submitted by Bayer in this Appendix.

EPA has also responded in the same Section IV. A. response that metallic contaminants found in eastern monitoring wells and in an eastern residential well water cannot be dismissed as background contamination, as suggested by Bayer. Background levels of metals in the area of the Himco Dump Site have been demonstrated, using site monitoring wells, to be extremely low, and the metal concentrations in the eastern area well water greatly exceed these background levels. EPA is not certain where the extreme levels of metals in ground water, cited by Bayer, were located in Elkhart County, or whether these locations would meet EPA's definition of background. EPA does acknowledge that there may be many other areas of Elkhart Counties that have elevated levels of metals, and perhaps other contaminants in their ground water, but this does not and should not influence the Himco Dump assessment. EPA does hope that residents of these "other" areas are not using this ground water as a potable water source.

EPA does not support the arbitrary use of new, un-validated, methods from the literature to derive exposure point concentrations of contaminants in air, water or any other media, and generally relies in standard methodologies which have been evaluated by EPA's research office. However, EPA does acknowledge that their contractor used some outdated input values in the calculations in the human health risk assessment presented in the SSI/SCR, which may have resulted in some spurious risk estimates, even though the SSI/SCR text suggested that the estimates were done correctly. EPA Region 5 continues to support the use of standard methodologies in the preparation of human health risk assessment for Region 5 Superfund sites.

To offer some balance to the Risk Characterization results of the risk assessment reported in Table C-7 of Appendix A, EPA has summarized the contaminant levels found in the eastern residential well water (at any well at any depth) and compared them to the trigger levels for several pathways from exposure to ground water, as presented in the 2002 Region IX PRG Tables. While these tables do not represent a risk assessment, they do identify risk levels of contaminants in various media using standard EPA methodologies and chemical toxicity values which were reviewed by EPA's National Center for Exposure Assessment (NCEA) in Cincinnati. The use of generic PRG values in this manner is not inappropriate, given the lack of site-specific data to change parameter inputs in the standardized risk equations. The following table presents EPA's summary of relevant information regarding these contaminant concentrations and relevant risk levels. Note that dermal exposure is not considered in the Region IX PRG calculations.

Contaminant	Residenti al Well Conc. µg/L	Region IX 2002 PRG Table Value for tap water (µg/L)							
		10 ⁻⁶ risk Cancer oral	10 ⁻⁶ risk Cancer inhale	10 ⁻⁶ risk Cancer Total	Res. Well CA Risk (x10 ⁻⁶)	HQ=1 NonCA oral	HQ=1 NonCA inhale	HQ=1 * NonCA Total	Res. Well HQ
benzene	0.4	1.2	0.46	0.34	1.18	110	12	11	0.017
chloroform	0.4					3700	6.3	6.2	
1,1- dichloroethane	12					3700	1000	810	
1,2- dichloroethane	0.7	0.74	0.15	0.12	5.83	1100	10	10	0.070
cis-1,2- dichloroethene	3					370	73	61	0.049
1,2- dichloropropane	10	0.99	0.20	0.18	55.56	40	8.3	6.9	1.449
methylene chloride	6	9.0	8.2	4.3	1.39	2,200	6,300	1,600	
vinyl chloride	0.9	0.022	0.21	0.020	45.00	110	210	72	
arsenic	8	0.045		0.045	177.78				
chromium	<6.7								
iron	6,129					11,000		11,000	
manganese	380					880		880	0.43
adult + child all chemicals Total Risk or total HI					2.9x10 ⁻⁴				2.0

* EPA Region 5 uses a HQ = 0.1 for screening non carcinogens

Using this simple comparison, EPA has clearly demonstrated that both the cancer risk estimates and the non-cancer HI for residents exposed to water from eastern area residential well in some locations exceeds the risk estimates submitted by Bayer by an order of magnitude and exceed EPA's level for developing remedial response actions. This difference is primarily due to inclusion of inhalation exposure to all volatile organic contaminants (Bayer did not include inhalation exposure of the most volatile contaminants in their assessment) and inclusion of metal contaminants (primarily arsenic). EPA's comparisons did not include the dermal pathway, which Bayer has suggested is minimal but included in their risk characterization. This risk estimate is not overly conservative as reasonable methodology and parameter inputs were considered in the derivation, and maximum values for contaminant concentrations used in the comparison were actual concentrations found in the several wells which contained the risk-driving chemicals. These estimates from summing the contaminant concentration comparisons with risk values using standardized EPA methodologies and relevant toxicity values are similar to the risk estimates that EPA would have developed if such a task had been undertaken in the SSI/SCR using this data set.

Comments Appendix C, Section V. : Bayer has commented in the introductory paragraph to Section V. that future residential development of currently undeveloped portions of the CDA south of the Himco Dump Site is not likely, that use of shallow ground water is highly likely (sic) given the availability of a municipal supply in this area, and thus the this exposure scenario is not a reasonably likely scenario.

EPA's Response: EPA does not agree with this comment. EPA has previously comment in response to the Section III. Comments that private residential wells in the CDA have not been abandoned and are still in place, and the use of these wells by present or future residents cannot be controlled or prevented. A demonstration of risk associated with use of water from these wells as a potable water supply can prevent further use by requiring that these wells be abandoned and sealed, in accordance with Indiana Department of Natural Resources requirements and that deed restrictions be placed on each property to prohibit any future private well construction and use of ground water in this area. In addition, EPA cannot determine the future land use of the site or the CDA area located to the south of the site. EPA's preference is for meaningful reuse of contaminated hazardous waste sites, and indeed several options, including construction of recreational education facilities for children, have been suggested for the currently undeveloped portions of the CDA. EPA has an obligation to the public to assess the potential for risks from all pathways of exposure in contaminated areas that may be used for future development and to exercise prudent controls to eliminate any such risks to populations who may be exposed with future development.

Comments Appendix C, Section V. A: Bayer has commented in a section on Chemicals of Potential Concern that the SSI/SCR is based on a flawed and improper site attribution analysis, that a) considered only two shallow wells in characterizing background ground water quality and the background wells were not sampled on two occasions, and that b) bromide concentrations levels were not used to identify wells impacted by landfill leachate. Bayer has further commented c) on comparisons of several ground water contaminants with concentrations found in other parts of Elkhart County.

EPA's Response: EPA does not agree with Bayer's comments. To support the comment that the site attribution analysis was based on an inappropriate and inapplicable statistical test, this Comment includes a foot note (#20), which is referenced to page 9-47 of the SSI/SCR. However, the text on page 9-47 of the SSI/SCR discusses the carcinogenic and non carcinogenic risk characterization for soils in Land Parcel Q, not ground water statistical comparisons. It is thus not clear to EPA to what Bayer's comment refers.

As described in the risk assessment in Chapter 9 of the SSI/SCR, current and future off-site residents in the CDA were assumed to be exposed to ground water at well locations WT116A and WT119A. Monitoring well WT116A was chosen as this well is located within the CDA, and monitoring well WT119A was chosen as this well is located immediately downgradient of both the CDA and WT116A. The contaminants in the shallow wells were considered to best represent the potential for impacts on the private residential wells still in place in the area. These monitoring wells were also chosen because they represent the most contaminated area of the ground water plume emanating from the landfill and CDA both horizontally and vertically, and have the most potential to affect the receptors of concern. These wells are also most likely to exhibit residual contamination from the drum field previously located in this area. Monitoring wells WT111A, WT115A, WT116B and WT118B are located either deeper or side-gradient of the prior landfill/CDA drum field. Contaminant levels detected in ground water samples from these wells are significantly less than those found in monitoring wells WT116A and WT119A. Monitoring wells not immediately downgradient of the CDA were not considered for use in this Himco Dump Site/CDA off-site Residential Area portion of the risk assessment.

a) Bayer's comment that only two shallow wells, and no deeper wells, were considered in characterizing ground water quality does not make any sense. The wells sampled in the SSI/SCR are identical to those designated in the *Work Plan for Supplemental Site Characterization and Access Controls at the Himco Landfill NPL Site, Elkhart, Indiana*, prepared by QST Environmental and submitted to EPA in January 1998 by the Bayer Corporation. The Work Plan, Section 2.3 Ground Water Monitoring, specified that "Two upgradient wells (WT102A and WT112A) will also be sampled." Thus, EPA's further characterization activities are consistent with those proposed by Bayer in 1998.

In addition, because of parameter differences between shallow and deeper wells, EPA did not consider it appropriate to compare the water quality parameters in deeper wells with those in the shallower wells used in the risk assessment for the CDA. For example, the vertical direction of ground water flow is complex, changing between well clusters and over time within a well cluster. Vertical flow gradients within the upper 200 feet of the out wash deposits include both upward and downward values. During the RI, Donahue calculated the vertical flow gradients from the two well clusters located at the southeast (WT101A, WT101B, WT101C) and northwest (WT102A, WT102B, WT102C) corners in the site, all of which are screened in different sections of the upper and lower aquifers. During water levels collected in February 1991, the WT101 cluster had downward vertical gradients (Donahue, 1992). However for the water levels collected in November 1991 (Donahue, 1992) and April 2000 (Section 3.1 of the SSI/SCR), upward vertical gradients were noted. For the February and November 1991 dates, the WT102 cluster had upward vertical gradients. For the April 2000 measurement, the

shallowest well pair (WT102A and WT102B) had a downward vertical gradient. On the other hand, the deeper well pair (WT102B and WT102C) had an upward vertical gradient. Contaminant concentration patterns also demonstrate changes with well depth. In summary, EPA believes that it is more appropriate to compare water quality parameters in the shallow monitoring wells in the CDA with those in the shallow background wells, which is the approach taken in the CDA risk assessment.

b) Regarding the use of bromide data to identify wells which may have been impacted by landfill leachate or may be impacted in the future, Chapter 7 in the SSI/SCR contains an in-depth discussion of this issue. It was noted that the attenuation mechanisms vary based on the contaminants. A non-reactive contaminant such as bromide has only advection, dispersion and dilution as the major attenuation mechanisms. While all of the contaminants will have advection, dispersion and dilution effects, for many of the metals the likely additional attenuation mechanism is precipitation/dissolution and oxidation/reduction with some sorption. For the organic compounds, sorption may be limited. Some biodegradation may be occurring, but it is most likely confined to within and in the immediate vicinity of the landfill. This conclusion is supported by the apparent rapid disappearance of organics between the soils/leachate samples and the ground water wells closest to the site. Volatilization losses through the landfill cover and movement of soil gas off-site may also account for the continuing loss of volatile contaminants.

To illustrate how the potential contaminants may have moved through ground water, a review of the movement of the bromide plume through the ground water system at the Site was presented in Chapter 7. The bromide trends indicate that past concentrations of contaminants may have been greater than currently observed concentrations. This is clearly illustrated in Figure 7-18 by how the bromide plume has changed over time. Three periods of data collection are presented in Figure 7-18; November/December 1980, August 1988 and April/May 2000. Approximately 10 years separates each of the sampling events, which allows for sufficient time between sampling events to pass for illustrative purposes. The first two dates of data collection were presented in the 1991 USGS Report, while the last sampling date presented is the last round of extensive sampling completed on the site. Limitations on the use of this data is that very few wells have been sampled for all of these sampling events. Monitoring wells WTE1, WTE3, WTG1 and WTG3 have been the only wells sampled for each of these events. The latest (2000) data indicate generally lower concentrations of the bromide in all three layers sampled. However, the WTM cluster was not available for sampling (having been removed by the USACE in 1996). The WTE cluster has shown significant decreases of bromide with time. However, the downgradient clusters (WTI and WTJ clusters) were not sampled as a part of the 2000 sampling event. Therefore, the extent or lateral migration of the bromide plume downgradient was not determined. The WTI cluster had apparently been destroyed in the late 1990's and was unavailable for sampling. WT116A, a new shallow well in the upper aquifer, had the highest concentration of bromide at 2.4 mg/L. This well is not far from the former WTM cluster location.

The elevated bromide detected in ground water, supports the conclusion that the landfill is still contributing to ground water quality degradation, as indicated by the trends between WTM2/WT116A. Furthermore, this trend would be expected to continue because of the lack of

source removal or control. In addition, if a conservative tracer, such as bromide, is still present in shallow ground water by the landfill at concentrations that are not much lower than those found 20 years ago, then the possibility of other contaminants that are not as mobile entering the ground water flow system is likely. This confirms the continued detections of organics and other contaminants that have been detected over time, and would likely continue into the future.

c) Regarding Bayer's comparison of maximum detected metal concentrations with "background" concentrations found in other parts of Elkhart County, EPA is not certain where the extreme levels of metals in ground water cited by Bayer were located in Elkhart County, or whether these locations would meet EPA's definition of background. EPA does acknowledge that there may be many other areas of Elkhart County that has elevated levels of metals, and perhaps other contaminants in their ground water, but this does not and should not influence the Himco Dump assessment. EPA does hope that residents of these "other" areas are not using this ground water as a potable water source.

In addition, Bayer has commented that *antimony* was not elevated in monitoring wells WT116A and WT119A relative to background levels, and cites the maximum value of 29.7 µg/L found in Elkhart County as a reasonable background level. EPA has further reviewed the data on this contaminant in the CDA ground water. While background well WT102A exhibited an antimony level of 21.7 µg/L in the 1998 sampling, the maximum value in WT116A was compared to the average concentration in the background wells (12.4 µg/L). In any case, antimony was not a driving chemical in the risk assessment, and the target non carcinogenic Hazard Index still greatly exceeds unity (1.0) based on the presence of other metal contaminants.

Bayer has commented that *arsenic* was not elevated in monitoring wells WT116A and WT119A relative to background levels, and cites the maximum value of 14 µg/L found in Elkhart County as a reasonable background level. The maximum detection of 6 µg/L (WT119A; 2000) used in the CDA assessment exceeds the levels found in any shallow upgradient well (WTB1, WT102A, WT112A, WT113A), which had non-detectable levels of arsenic in all sampling rounds. Very high levels of arsenic were also consistently found in monitoring well WT114A located east of the Himco Dump site.

Bayer has commented that *chromium* was not elevated in monitoring wells WT116A and WT119A (maximum = 7.8 µg/L) relative to background levels, and cites the maximum value of 24.6 µg/L found in Elkhart County as a reasonable background level. Actually, chromium was found in background well WT102A at a concentration of 23.9µg/L. Chromium was not included as a contaminant in the CDA ground water risk assessment.

Bayer has commented that *manganese* was not elevated in monitoring wells WT116A and WT119A (maximum = 1,810 µg/L) relative to the maximum "background" concentration (1,870 µg/L) detected in Elkhart County. The detected level of manganese is approximately 2 times the non-cancer trigger level for manganese in drinking water (880 µg/L), and exceeds the levels found in any shallow upgradient background well (WTB1, WT102A, WT112A, WT113A), in which detections were well below 100 µg/L in all sampling rounds.

Bayer has commented that *thallium* was not elevated in monitoring wells WT116A and WT119A relative to background levels, and cites the maximum value of 5.7 µg/L found in Elkhart County as a reasonable background level. The maximum detection of 5.5 µg/L used in the CDA assessment exceeds the levels found in any shallow upgradient well (WTB1, WT102A, WT112A, WT113A), which had non-detectable levels of thallium in all sampling rounds.

Bayer has commented that *bis(2-ethylhexyl) phthalate* (BEHP) was not elevated in monitoring wells WT116A and WT119A relative to background levels, and cites the maximum value of 39 µg/L found in Elkhart County as a reasonable background level. EPA risk assessment methodology (RAGS, Part A) does not recommend that organic contaminants be screened against background, as these compounds are not considered to be naturally occurring. Thus EPA believes that it is appropriate to include BEHP in the risk characterization. However, BEHP was not a driving chemical in the risk assessment, and contributed only minimally to the carcinogenic risk and the target non carcinogenic HI. Thus, deletion of BEHP in the CDA ground water risk assessment would not impact the risk estimates associated with this medium.

EPA notes that Bayer failed to comment on the levels of *iron* in monitoring wells WT116A and WT119A, probably because they greatly exceeded the maximum cited "background" concentration (17,200 µg/L) cited by Bayer as detected in Elkhart County. Then maximum level of iron found in these monitoring wells was 32,400 µg/L (WT116A; 2000); the recommended daily intake of iron for infants is 6,000 µg/day. Young children may consume as much as one liter of water a day from drinking water and in formula and food prepared with the water. Iron levels in shallow wells available to characterize background ranged from 4.7 µg/L - 903 µg/L, with the maximum level being detected in one well not used in the CDA background comparison (WTB1; 1990), suggesting that the iron levels in the CDA wells are significantly greater than the local background levels. The National Academies of Science recommends that drinking water should not be the primary source of this mineral for infants, and that excess intakes can cause abdominal pain, nausea and vomiting. Receptors with hereditary hemochromatosis, a common inherited single-gene disorder, should also avoid ingestion of this water. Bayer did not consider the iron concentrations in their revised risk assessment for the CDA.

EPA also found that *calcium* levels as high as 685,000 µg/L (WT116A; 2000) were found in monitoring wells WT116A and WT119A. The maximum calcium intake for infants under the age of one year is 60,000 µg/day, with no intake from water recommended. Thus to prevent milk alkali syndrome and gastrointestinal discomfort, the water at these residences should not be given to infants as drinking water or used in their formula or food preparation.

The levels of *sodium* found in monitoring wells WT116A and WT119A 5 were between 61,100 µg/L - 195,000 µg/L, suggesting that the water should not be used by those on a low sodium diet (whose water should not contain more than 20,000 µg/L). Excessive levels of sodium in residential wells to the south of the Himco Dump site resulted the distribution of municipal water to residents of the CDA in the past. However, the residential wells remain in place at the present time.

EPA further notes that elevated levels of a number of organic contaminants were found in

sampling rounds from monitoring wells WT116A and WT119A. *Benzene* was found at a concentration of 15 µg/L in WT116A in 1995; *carbazole* was found at a concentration of 6.0 µg/L in WT116A in 1995; *1,2-dichloropropane* was found at a concentration of 4.0 µg/L in WT116A in 1995; *vinyl chloride* was found at a concentration of 1.0 µg/L in WT116A in 2000.

Comments Appendix C, Section V. B: Bayer has commented in a section on Exposure Point Concentrations (COPC) that concentrations in ground water south of the Himco landfill are generally declining due to natural attenuation processes and thus the most recent sampling data (November 2000) will be closer to future exposure concentrations than the historic data and should be used in the risk assessment.

EPA's Response: EPA does not agree with Bayer's comments. While it is likely that some biodegradation of organic contaminants may be occurring, most likely confined to within and in the immediate vicinity of the landfill, and the apparent disappearance of some organic compounds between the soils/leachate samples and the ground water wells closest to the site has been observed, EPA does not believe that the data collected to date are sufficient to demonstrate any trends in reduction of contaminants. Bayer has also failed to note that most chlorinated organic compounds degrade to more toxic species, which may result in an increased risk with exposure to these contaminants. Further periodic sampling of existing and additional monitoring wells in the future will be required to support an assumption of natural attenuation without risk to CDA residents. And future sampling may well detect the presence of more toxic contaminants in ground water, given that the analytical detection limits used in past sampling rounds often exceeded relevant point of departure levels (cancer risk of 10^{-6} and noncancer HQ of 0.1) by several orders of magnitude for some compounds.

During the 1998 ground water sampling events a high detection limit (10 µg/L) was used in the sample analysis making it impossible to know if MCLs for volatile organic contaminants were exceeded in this sampling event. Attenuation of contaminant concentrations and compliance with drinking water MCLs cannot be based on a single sampling round in 2000. Most volatile organic contaminants of interest in drinking water have MCLs well below 10 µg/L, with some (e.g., vinyl chloride and benzo(a)pyrene) having MCLs at 2 µg/L and 0.2 µg/L, respectively; thus, it is unlikely that these would have been detected in the 1998 and earlier sampling events. In addition, the five sampling rounds in WT116A and two sampling rounds in WT119A were taken at different times of the year. Seasonal variations in contaminant concentrations have been demonstrated in ground water at other Superfund Sites (e.g., the Roy Blackwell Forest Preserve Landfill, Du Page County, Illinois) when quarterly data were available. Contaminant concentrations that exceeded MCL values (benzene; Sept. 1995, Nov. 1996, Nov. 2000) have been detected in some samples taken from well WT116A, suggesting that contaminant levels in ground water at the Himco site may exhibit seasonal variation as well. However, for the reasons stated above, no time trends in contaminant concentrations can be projected from these data. Periodic monitoring of site wells will be required to determine whether significant elevation in contaminant levels are indeed occurring at this site or site contaminant levels are attenuating.

Volatilization losses through the landfill cover and movement of soil gas off-site, which may also account for the loss of volatile contaminants, is continuing, as demonstrated in the soil gas

samples taken in the most recent years, and it is not certain if this is due to attenuation processes or to new releases within the Himco Dump site. However, volatilization and soil gas migration losses do not occur without presenting other impacts to human health from other pathways of exposure.

In either case, EPA does not consider it appropriate to speculate when risks to human health are concerned, and thus considers it appropriate to look at all relevant data when developing potential site risk estimates.

Comments Appendix C, Section V. C: Bayer has commented in a section on Risk Characterization that the cumulative lifetime cancer risk to residents using ground water from well WT116A is 2.5×10^{-5} and that the non-carcinogenic risk is reflected by a HI less than 1.0, based on a human health risk assessment they submitted, which is based only on exposure to the volatile and semi-volatile contaminants detected in the November 2000 sampling round. Exposures to metallic compounds in ground water were not included in the assessment, and literature values for national average chloroform transfer coefficients from the literature were used to derive air exposure concentrations. Bayer has stated that they believe that the health risk assessment is conservative.

EPA's Response: EPA does not agree with Bayer's comments, as reflected in the above responses to the individual sections in Appendix A, Section V, where these issues are discussed, or with the health risk assessment prepared for the CDA wells WT116A and WT119A. EPA believes that the health risk assessment for the CDA residential well water exposures submitted by Bayer seriously under estimates the risks to residents using this water as a potable water source.

EPA has responded in the Section V. A. that metallic contaminants found in the shallow CDA wells used to characterize risks from ground water use to present or future residents in the CDA cannot be dismissed as background contamination, as suggested by Bayer. Background levels of metals in the area of the Himco Dump Site have been demonstrated, using site monitoring wells, to be extremely low, and the metal concentrations in the CDA monitoring wells greatly exceed these background levels. EPA is not certain where the extreme levels of metals in ground water, cited by Bayer, were located in Elkhart County, or whether these locations would meet EPA's definition of background. EPA does acknowledge that there may be many other areas of Elkhart County that have elevated levels of metals, and perhaps other contaminants in their ground water, but this does not and should not influence the Himco Dump assessment.

EPA does not support the arbitrary use of new, un-validated, methods from the literature to derive exposure point concentrations of contaminants in air, water or any other media, and generally relies in standard methodologies which have been evaluated by EPA's research office. However, EPA does acknowledge that their contractor used some outdated input values in the calculations in the human health risk assessment presented in the SSI/SCR, which may have resulted in some spurious risk estimates, even though the SSI/SCR text suggested that the estimates were done correctly. EPA Region 5 continues to support the use of standard methodologies in the preparation of human health risk assessment for Region 5 Superfund sites.

EPA's risk assessment for exposure to carcinogenic and non carcinogenic contaminants in the CDA monitoring wells in the area downgradient of the former dump removal, where ground water contaminants have been found to be elevated, is based on all data from the 1995 to 2000 sampling of wells WT116A and WT119A which met the stringent requirements for use in a quantitative risk assessment. Comparison with risk-based screening values and appropriate comparisons with upgradient site background wells, which represent background levels in the immediate vicinity of the Himco Dump Site, were used to develop the list of contaminants of potential concern (COPCs) for the risk assessment.

The cancer risk to groundwater is based on exposure to arsenic (6.0 µg/L), BEHP (7.0 µg/L), carbazole (6.0 µg/L), benzene (15.0 µg/L), 1,2-dichloropropane (4.0 µg/L) and vinyl chloride (1.0 µg/L). The lifetime cancer risk, based on ingestion of CDA ground water alone, was determined to be 1.75×10^{-4} . Thus, the cancer risk from oral exposure alone demonstrates an unacceptable risk. In addition, the cancer risks for inhalation exposure for some contaminants can be expected to exceed their respective oral risks because some of the compounds are very volatile compounds with high inhalation toxicity (e.g., benzene, 1,2-dichloropropane).

The non cancer risk to groundwater is based on exposure to antimony (20.4 µg/L), arsenic (6.0 µg/L), iron (32,400 µg/L), manganese (1,810 µg/L), thallium (5.5 µg/L), BEHP (7.0 µg/L), carbazole (6.0 µg/L), benzene (15.0 µg/L), 1,2-dichloropropane (4.0 µg/L) and vinyl chloride (1.0 µg/L). The non cancer risk, based on ingestion of CDA ground water alone, was determined to result in a total HI of 18.73, which greatly exceeds unity (1.0), EPA's level of concern. And the non cancer Hazard Quotients (HQ) for inhalation exposure for some contaminants can be expected to exceed their respective oral HQ because some of the compounds are very volatile compounds with high inhalation toxicity (e.g., benzene, 1,2-dichloropropane). In addition, the extremely high levels of calcium and sodium found in the CDA ground water constitutes an immediate risk to some population who may be exposed to this water.

EPA believes that the risk assessment and the cancer and non cancer risk estimates developed for potential exposure to CDA ground water in the SSI/SCR demonstrate an unacceptable risk level and a requirement to cap the remaining residential wells in this area and institute restrictions on future use of ground water in this area in order to insure continuing protection of health for the present and future residents of the area.

Response to Comments submitted by W.C. Blanton on behalf of Dura Automotive Systems of Indiana, Inc. and other parties identified.

Comment 1, page 1: The identified parties have commented: *"The water quality data for groundwater at and in the vicinity of the Site indicate that the landfill at the Site ("Landfill") is not a source of significant groundwater contamination at or downgradient from the Site. Given the length of time since the Landfill closed, there are no reasonable grounds to believe that groundwater at and downgradient of the Site will be significantly adversely impacted by contamination at the Site in the future. Therefore, there is no technical justification for (a) either the Landfill cover called for in the ROD or the Landfill cover currently proposed by EPA, (b) the proposed connection of residences located east of the Landfill to the Elkhart public water supply system, or (c) the contingent groundwater remedy."* The Technical Memorandum prepared by ARCADIS G&M, Inc. provided specific comments for this issue which are addressed below.

EPA's Response: EPA does not agree with this comment or the comments in the Technical Memorandum.

(a) ARCADIS has commented that with limited exceptions, potential impacts from the landfill to groundwater do not exist because detections of VOCs in the monitoring wells were sporadic and concentrations in the 2000 sampling were low. EPA does not agree with these comments. During the earlier groundwater sampling events a high detection limit (10µg/L) was used in the sample analysis making it impossible to know if MCLs for volatile organic contaminants were exceeded in this sampling event. Attenuation of contaminant concentrations and compliance with drinking water MCLs cannot be based on a single sampling round in 2000. Most volatile organic contaminants of interest in drinking water have MCLs well below 10µg/L, with some (e.g., vinyl chloride and benzo(a)pyrene) having MCLs at 2.0µg/L and 0.2µg/L, respectively; thus, it is unlikely that these would have been detected in the 1998 and earlier sampling events. In addition, sampling rounds were taken at different times of the year. Seasonal variations in contaminant concentrations have been demonstrated in groundwater at other Superfund Sites (e.g., the Roy Blackwell Forest Preserve Landfill, Du Page County, Illinois) when quarterly data were available. Contaminant concentrations that exceeded MCL values (benzene; Sept. 1995, Nov. 1996, Nov. 2000) have been detected in some samples taken from well WT116A, suggesting that contaminant levels in groundwater at the Himco site may exhibit seasonal variation as well. However, for the reasons stated above, no time trends in contaminant concentrations can be projected from these data.

EPA's risk assessment for exposure to carcinogenic and non carcinogenic contaminants in the CDA monitoring wells in the area downgradient of the former emergency drum removal, where groundwater contaminants have been found to be elevated, is based on all data from the 1995 to 2000 sampling of wells WT116A and WT119A which met the stringent requirements for use in a quantitative risk assessment. Comparison with risk-based screening values and appropriate comparisons with upgradient site background wells, which represent background levels in the immediate vicinity of the Himco Dump Site, were used to develop the list of COPCs for the risk assessment.

The cancer risk to groundwater is based on exposure to arsenic (6.0µg/L), BEHP (7.0µg/L), carbazole (6.0µg/L), benzene (15.0µg/L), 1,2-dichloropropane (4.0µg/L) and vinyl chloride (1.0 µg/L). The lifetime cancer risk, based on ingestion of CDA groundwater alone, was determined to be 1.75×10^{-4} . Thus, the cancer risk from oral exposure alone demonstrates an unacceptable risk. In addition, the cancer risks for inhalation exposure for some contaminants can be expected to exceed their respective oral risks because some of the compounds are very volatile compounds with high inhalation toxicity (e.g., benzene, 1,2-dichloropropane).

The non cancer risk to groundwater is based on exposure to antimony (20.4µg/L), arsenic (6.0µg/L), iron (32,400µg/L), manganese (1,810µg/L), thallium (5.5µg/L), BEHP (7.0µg/L), carbazole (6.0µg/L), benzene (15.0µg/L), 1,2-dichloropropane (4.0µg/L) and vinyl chloride (1.0µg/L). The non cancer risk, based on ingestion of CDA groundwater alone, was determined to result in a total HI of 18.73, which greatly exceeds unity (1.0), EPA's level of concern. And the non cancer HQ for inhalation exposure for some contaminants can be expected to exceed their respective oral HQ because some of the compounds are very volatile compounds with high inhalation toxicity (e.g., benzene, 1,2-dichloropropane). In addition, the extremely high level of calcium and sodium found in the CDA groundwater constitutes an immediate risk to some population who may be exposed to this water.

EPA believes that the risk assessment and the cancer and non cancer risk estimates developed for potential exposure to CDA groundwater in the SSI/SCR demonstrate an unacceptable risk level and a requirement to cap the remaining residential wells in this area and institute restrictions on future use of groundwater in this area in order to insure continuing protection of health for the present and future residents of the area.

(b) ARCADIS has commented that VOCs from the residential wells for 2000 confirm that no VOC plume is affecting the domestic wells east of the landfill; concentrations in the residential wells were low, and the metal concentrations do not show a distinct pattern of a plume in the groundwater system. EPA has summarized the contaminant levels found in the eastern residential well water (at any well at any depth) and compared them to the trigger levels for several pathways from exposure to groundwater, as presented in the 2002 Region 9 PRG Tables. While these tables do not represent a risk assessment, they do identify risk levels of contaminants in various media using standard EPA methodologies and chemical toxicity values which were reviewed by EPA's National Center for Exposure Assessment (NCEA) in Cincinnati, Ohio. The use of generic PRG values in this manner is not inappropriate, given the lack of site-specific data to change parameter inputs in the standardized risk equations. The following table presents EPA's summary of relevant information regarding these contaminant concentrations and relevant risk levels. Dermal exposure is not considered in the Region 9 PRG calculations.

Contaminant	Residential Well(RW) Conc. µg/L	Region 9 2002 PRG Table Value for tap water (µg/L)							
		10 ⁻⁶ risk Cancer oral	10 ⁻⁶ risk Cancer inhale	10 ⁻⁶ risk Cancer Total	RW Cancer Risk (x10 ⁻⁶)	HQ=1 Non Cancer oral	HQ=1 Non Cancer inhale	HQ=1* Non Cancer Total	RW HQ
benzene	0.4	1.2	0.46	0.34	1.18	110	12	11	0.017
chloroform	0.4					3700	6.3	6.2	
1,1-dichloroethane	12					3700	1000	810	
1,2-dichloroethane	0.7	0.74	0.15	0.12	5.83	1100	10	10	0.070
cis-1,2-dichloroethene	3					370	73	61	0.049
1,2-dichloropropane	10	0.99	0.20	0.18	55.56	40	8.3	6.9	1.449
methylene chloride	6	9.0	8.2	4.3	1.39	2,200	6,300	1,600	
vinyl chloride	0.9	0.022	0.21	0.020	45.00	110	210	72	
arsenic	8	0.045		0.045	177.78				
chromium	<6.7								
iron	6,129					11,000		11,000	
manganese	380					880		880	0.43
adult + child all chemicals Total Risk or total HI					2.9x10 ⁻⁴				2.0

* EPA Region 5 uses a HQ = 0.1 for screening non carcinogens

Using this simple comparison, EPA has clearly demonstrated that both the cancer risk estimates and the non cancer HI for residents exposed to water from eastern area residential wells in some locations exceed the risk estimates submitted by Bayer by an order of magnitude and exceed EPA's level for developing remedial response actions. This difference is primarily due to inclusion of inhalation exposure to all volatile organic contaminants (Bayer did not include inhalation exposure of the most volatile contaminants in their assessment) and inclusion of metal contaminants (primarily arsenic). EPA's comparisons did not include the dermal pathway, which Bayer has suggested is minimal but included in their risk characterization. This risk estimate is not overly conservative as reasonable methodology and parameter inputs were considered in the derivation, and maximum values for contaminant concentrations used in the comparison were actual concentrations found in the several wells which contained the risk-driving chemicals. These estimates from summing the contaminant concentration comparisons with risk values using standardized EPA methodologies and relevant toxicity values are similar to the risk estimates that EPA would have developed if such a task had been undertaken in the SSI/SCR using this data set.

c) ARCADIS has commented that groundwater quality will not further deteriorate in the future due to the landfill because the landfill was closed in 1976. EPA does not agree with Bayer's comments. The elevated bromide detected in groundwater, supports the conclusion that the landfill is still contributing to groundwater quality degradation, as indicated by the trends between WTM2/WT116A. Furthermore, this trend would be expected to continue because of the lack of source removal or control. In addition, if a conservative tracer, such as bromide, is still present in shallow groundwater by the landfill at concentrations that are not much lower than those found 20 years ago, then the possibility of other contaminants that are not as mobile entering the groundwater flow system is likely. This confirms the continued detections of organics and other contaminants that have been detected over time, and would likely continue. In addition, while it is likely that some biodegradation of organic contaminants may be occurring, most likely within and in the immediate vicinity of the landfill, and the apparent disappearance of some organic compounds between the soils/leachate samples and the groundwater wells closest to the site have been observed, EPA does not believe that the data collected to date are sufficient to demonstrate any trends in reduction of contaminants. ARCADIS have also failed to note that most chlorinated organic compounds degrade to more toxic species, which may result in an increased risk with exposure to degradation products. Further periodic sampling of existing and additional monitoring wells in the future will be required to support an assumption of natural attenuation without risk to CDA and Eastern Area residents. And future sampling may well detect the presence of more toxic contaminants in groundwater, given that the analytical detection limits used in past sampling rounds often exceeded relevant point of departure levels (cancer risk of 1×10^{-6} and non cancer HQ of 0.1) by several orders of magnitude for some compounds.

Comment 2, page 2: The identified parties have commented: "*The soil gas data for the Site and nearby areas indicate that the generation of gas at the Landfill is not significant with respect to nearby residences. Therefore, there is no technical justification for the soil gas collection system called for in the ROD and the proposed amendments to the ROD.*" The Technical Memorandum prepared by ARCADIS G&M, Inc. provided specific comments for this issue which are addressed below.

EPA's Response: EPA does not agree with this comment or the comments in the Technical Memorandum. EPA believes that the results of the soil gas sampling events

demonstrate that methane, hydrogen sulfide and other VOCs are migrating from the landfill toward offsite residences to the south and east, and that the installation of an active landfill gas collection system will be required to control the migration of toxic and explosive gases that are presently migrating from the site.

(1) ARCADIS have further commented that Figures 5-1 through 5-4 of the SSI/SCR indicates that VOCs in the soil have not migrated onto residential properties, and have only been found outside the landfill in areas where there are no buildings or residences. EPA agrees that the soil gas sampling conducted in the SSI/SCR demonstrates that VOC concentrations are associated with releases from the landfill, as is shown by the decrease in contaminant concentrations with distance from the landfill. However, EPA disagrees with the comment that the VOCs in soil have not migrated onto residential properties. Sampling in the area to the east of the site has detected contaminants in soil gas samples taken in public areas (parkways) both west (between the landfill and the residential structures) and east of the structures, suggesting that homes in this area are positioned to naturally intercept this vapor movement during periods when the ground is frozen and escape of volatile gases to ambient air is blocked. Sampling in the CDA south of the landfill targeted both residential and undeveloped commercial/industrial parcels because the land use may change in the future in a manner that would result in exposure to residential or other receptor populations. There are no restrictions on land use of offsite properties south of the landfill.

(2) ARCADIS have further commented that VOCs in soil have not migrated very far from the landfill during the past 40 years and that a limited sampling conducted in buildings for hydrogen sulfide and methane in the past indicates that the landfill has not influenced the indoor air in the buildings of surrounding properties, suggesting that occupants of the buildings do not face a potential exposure to landfill gas now or in the future.

A Draft Work Plan for Supplemental Site Characterization and Access Controls at the Himco Landfill NPL Site, Elkhart, Indiana, prepared and submitted to EPA by QST Environmental at the request of the Himco PRP Group on January 6, 1998, presented a sampling strategy for soil gas sampling adjacently to the landfill. This soil gas sampling was requested by EPA due to new pieces of information which became available to EPA after the 1992 RI was completed. The first is the reporting in the open (peer-reviewed) literature that volatile chlorinated compounds move ahead of methane in the subsurface soil, and therefore these contaminants may be present in structures even when methane is not found. In addition, it has become apparent that the calcium sulfate cover material is degrading, a condition which may not have been detected in the pre-RI sampling. Recent studies have demonstrated that the products of degradation of hydrated calcium sulfate in landfills include both hydrogen sulfide and carbon disulfide. Regrettably, hydrogen sulfide concentrations were not measured during the supplemental soil gas sampling exercises, although the SSI/SCR does report problems with equipment failure to extremely high levels of hydrogen sulfide in some sampling locations.

It is clear that the PRP Group did not understand at that time the 1998 Work Plan was prepared that some VOCs (primarily the chlorinated hydrocarbons) have been demonstrated to migrate ahead of the methane plume, and the Bayer/PRP Group efforts proposed to focus on methane. The Bayer/PRP group never initiated this sampling, and EPA undertook this task, following the sampling scheme proposed in the Bayer/PRP Group Work Plan. The Work Plan states: “

Previous investigations to characterize soil gas constituents generated from the landfill have focused on the area within the boundaries of the landfill. The purpose of this soil gas survey at the Himco Dump Site is to determine whether landfill generated constituents in the soil gas are migrating horizontally away from the landfill to the south and east, where residences are located, and to quantify the levels of those constituents which are migrating." "Initially, 15 locations will be sampled along the southern and eastern boundary of the landfill. These initial points will be located approximately 50 feet from the landfill boundary and at approximately 200-foot intervals. Constituents to be sampled include methane, hydrogen sulfide, and non-methane VOCs. Where the concentration of methane is detected at concentrations equal to or greater than 25 percent of the lower explosive limit (LEL) at an initial sampling location, then two additional locations will be sampled stepping away from the landfill boundary in order to evaluate the attenuation of the detected constituent(s). Each secondary location will be approximately 70 feet in a direction of 45 degrees either side of the initial sampling location such that the three locations form a triangle. With this sampling configuration, the secondary sampling points will fall on a line parallel to but 50 feet farther away from the landfill boundary. The secondary locations will also be sampled for methane, hydrogen sulfide, and non-methane VOCs."

The soil gas sampling was subsequently conducted by EPA in accordance with a decision made at a December 14, 1999, meeting at the Bayer facilities in which both Bayer and EPA agreed that the collection of soil gas samples would provide adequate documentation of a vapor migration pathway and that the collection of indoor air samples in homes would not be desirable or required for future decision-making at the site. As previously stated, because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations in homes, the sampling points were not located near (within 10 feet) or underneath the residences. The 2002 EPA OSWER *Draft Guidance for Evaluating Vapor Intrusion to the Indoor Air Pathway From Groundwater and Soils* uses a three-tiered approach for assessing the vapor intrusion pathway, including primary and secondary screening of a site followed by a site-specific pathway assessment. The initial screening is based on the presence of contaminants in soil gas or groundwater within 100 ft of a building designed for human occupancy. The document also discusses the potential for mobile "vapor clouds" (gas plumes) which are caused by methane carrier gas in the vicinity of landfills, and which have been known to travel 100s of feet in distant from the landfill site.

The Phase I and Phase II soil gas sampling conducted in areas both south and east of the Himco Dump site clearly shows that contaminants have been found in soil gas within 100 ft of residential structures. The concentration of volatile contaminants detected in these soil gas samples strongly suggests the potential for an intact vapor intrusion pathway. Sampling in the area to the east of the site has detected contaminants in soil gas samples taken in public areas (parkways) both west (between the landfill and the residential structures) and east of the structures, suggesting the homes are positioned to naturally intercept this vapor movement during periods when the ground is frozen and escape of volatile gases to ambient air is blocked.

Because the sampling locations for the soil gas investigations were chosen in order to characterize the soil gas migration from the landfill rather than to provide data for modeling indoor air concentrations, the data were not considered by EPA to be suitable for modeling volatile gas concentrations in indoor air. Therefore, the data were not used quantitatively to

estimates risks to indoor air exposure. However, a qualitative discussion of the soil gas sampling results is presented in Chapter 5.0 of the SSI/SCR. Figures 5-1 through 5-4 present the contoured concentration data for the compound classes BTEX (benzene, toluene, ethyl benzene and xylene), chlorinated ethenes, chlorinated ethanes and vinyl chloride. All of the listed compound classes, as well as carbon disulfide, were found along the entire length of the southern offsite area of the landfill where sampling was performed. In one location south of the landfill, in the CDA, hydrogen sulfide levels were so great that the instrument detector was affected and sampling had to be halted.

EPA agrees that the soil gas sampling conducted in the Phase I and Phase II soil gas sampling events neither confirm that VOCs are present underneath any residence nor that they are not present underneath any residences. However the soil gas sampling has demonstrated that VOC gases are present in samples taken south and east of the landfill, and that they are due to migration of landfill gases at the Himco Dump Site as the VOC concentrations decrease readily with distance from the landfill. Further, the several VOCs have been detected in soil gas within 100 feet of residential structures at concentrations which exceed EPA screening value of 1×10^{-6} for carcinogens. The concentration of volatile contaminants detected in these soil gas samples suggests the potential for an intact vapor intrusion pathway.

However, it should be noted that soil gas samples were taken at a time of the year when the preferential VOC migration pathway would be upwards through the soil into the ambient air. During periods when the ground is frozen or otherwise capped by severe rain events, the soil gases would be trapped in the subsurface and the preferential migration for VOCs would be into structures. It is expected that wind forces, large temperature gradients and the operation of home furnaces in closed structures would contribute to the preferential soil gas migration into residences in the winter months, the first two factors acting to increase the "stack effect" or "chimney effect" which causes air to be drawn up and through the structure while the furnace acts to further pump air from the home and increase the soil gas movement into the structure. These events have been effectively demonstrated for the migration of radon gas into structures. For these reason, demonstrations of VOC movement in soil gas into residences are best demonstrated in winter months under closed-house conditions when the ground is frozen.

(3) ARCADIS have further commented that EPA indicated that inhalation of VOCs by people outdoors in areas where the VOCs in soil gas were found is a potentially complete pathway, but no sampling was done to confirm that VOCs are present in outdoor air. As discussed, the soil gas sampling was subsequently conducted by EPA in accordance with a decision made at a meeting at the Bayer facilities in which both Bayer and EPA agreed that the collection of soil gas samples would provide adequate documentation of a vapor migration pathway for future decision-making at the site. At no time was it ever considered that the soil gas samples would be used to evaluate risks in ambient air.

EPA notes that a number of the sampling locations shown in Figure 1 of Bayer's comment package, which presents a summary of soil gas sampling results from 1995-1999, exhibited levels greater than 25 percent methane . . . a level which poses a risk of explosion and fire. And, in one location south of the landfill in the CDA, hydrogen sulfide levels were so great that the instrument detector was affected and sampling had to be halted. EPA is also concerned by the strong smell of hydrogen sulfide that is emitting from the southeast corner of the landfill in the

ambient air. Carbon disulfide was detected in the soil gas samples taken along John Weaver Parkway. Sample TT-56 showed carbon disulfide levels of $19,999\mu\text{g}/\text{m}^3$; however, ambient air concentrations in the vicinity of the sampling were not measured. Concentrations of other VOCs detected in this sample included: tetrachloroethene ($6,000\mu\text{g}/\text{m}^3$, $34,884\mu\text{g}/\text{m}^3$), trichloroethene ($6,600\mu\text{g}/\text{m}^3$, $14,000\mu\text{g}/\text{m}^3$), and vinyl chloride ($20,000\mu\text{g}/\text{m}^3$, $16,000\mu\text{g}/\text{m}^3$), as well as other compounds. All these contaminant concentration levels were observed during periods of time when the ground was not frozen and preferential migration to the surface would be expected. During periods when the ground is frozen, the preferential migration pathway would be into structures. In addition, the detections of VOC in soil gas persisted in samples taken east of John Weaver Parkway and even east of the residences located adjacent to John Weaver Parkway, even though the samples were collected in April when the ground was no longer frozen and attenuation of the vapors by direct volatilization through the soil, which is predominantly sand and gravel and offers little resistance to flow, would have been expected. Indoor air sampling in residences to the south and east of the landfill under various meteorological conditions would be required to determine if volatile organic contaminants are migrating into these structures. A gas collection system would control both ambient air releases of landfill gases and migration of explosive and toxic gases into homes and other structures which may be constructed on or adjacent to the Himco Dump Site.

Comment 3, page 2: The identified parties have commented: *"The risk assessments utilized as bases for the ROD and the proposed amendments to the ROD overstate both cancer risks and non cancer hazards for all exposure scenarios and all pathways. It is highly unlikely that anyone has been, is being, or will be exposed to contaminants at the concentrations predicted by EPA or that any such exposures will occur at the concentrations predicted by EPA. An appropriate risk assessment that (a) utilizes only actual contaminant concentrations in the air and the water at and near the Site, (b) uses of all such available data, and (c) employs realistic and appropriate exposure assumptions will likely confirm that current conditions at and near the Site do not pose any risk of adverse effects to human health."* The Technical Memorandum prepared by ARCADIS G&M, Inc. provided specific comments for this issue which are addressed below.

EPA's Response: EPA does not agree with this comment or the comments in the Technical Memorandum. EPA also notes that the comments suggest a lack of understanding of the Superfund risk assessment process, as outlined in EPA *Risk Assessment Guidance for Superfund; Human Health Evaluation Manual Part A*, EPA 9285.701A, July 1989, and related Agency guidance document. The use of contaminant concentrations in water which best characterize the contaminant levels at the center of the groundwater plume and the use of EPA recommended models for modeling of indoor air concentrations represent standard EPA risk assessment methodology that has been consistently applied across all Superfund sites in Region 5 and other regions. The use of reasonable maximum exposure (RME) scenarios and inputs, rather than the use of central tendency exposure (CTE) scenario assures that there will be an approximately 90 percent probability that receptor populations will not suffer adverse health impacts from site contaminant exposures. Further, rather than assuring that current conditions at and near a site do not pose any risk of adverse effects to human health, EPA seeks to protect all generations of receptor populations from adverse health effects, not simply current populations. Thus, EPA methodology evaluates health impacts from all contaminants by all pathways of exposure to both current and future receptors of interest.

(1) ARCADIS have further commented on the sampling Data used in the human health risk assessment in the SSI/SCR:

(a) ARCADIS has commented that EPA used only groundwater data from wells WT116A and WT119A because they contain the highest concentrations of chemical contaminants found in the groundwater; ARCADIS further comments that these wells do not reflect actual concentrations to which residents might be exposed. The commenter also has commented that *“additional data (such as the residential well data) should be used to fully and accurately characterize the groundwater for risk assessment purposes.”* ARCADIS also comment that *“because the minimum and mean concentrations are not presented in any tables, it is difficult to determine if the maximum concentrations are representative of potential exposures.”* EPA is a bit confused by these groundwater comments. The residents to the south of the landfill currently use municipal water as their potable water source; thus, no residential well data are available for these receptors. However, the private residential wells in the CDA have not been abandoned and are still in place, and the use of these wells by present or future residents cannot be controlled or prevented. A demonstration of risk associated with use of water from these wells as a potable water supply can prevent further use by requiring that these wells be abandoned and sealed, in accordance with Indiana Department of Natural Resources requirements and that deed restrictions be placed on each property to prohibit any future private well construction and use of groundwater in this area. In addition, EPA cannot determine the future land use of the site or the CDA area located to the south of the site. EPA's preference is for meaningful reuse of contaminated hazardous waste sites, and indeed several options, including construction of recreational education facilities for children, have been suggested for the currently undeveloped portions of the CDA. EPA has an obligation to the public to assess the potential for risks from all pathways of exposure in contaminated areas that may be used for future development and to exercise prudent controls to eliminate any such risks to populations who may be exposed with future development. Thus, EPA has evaluated the potential for health risks from use of groundwater in the CDA.

ARCADIS commented that antimony and thallium should not have been included in the risk assessment, as they were only detected in one of six samples. EPA notes that it is not the usual practice to eliminate detected contaminants when the frequency of detection cannot be demonstrated to be less than 5 percent; this requires the collection of 20 samples (refer to section 5.9.3 in RAGS, Part A). However, EPA has further reviewed the data on antimony in the CDA groundwater. The maximum value in WT116A greatly exceeded the average concentration in the background wells (12.4µg/L). EPA notes that antimony was not a driving chemical in the risk assessment, and the target non carcinogenic HI greatly exceeds unity (1.0) based on the presence of other metal contaminants. The maximum detection of thallium of 5.5µg/L used in the CDA assessment also exceeds the levels found in any shallow upgradient well (WTB1, WT102A, WT112A, WT113A), which had non-detectable levels of thallium in all sampling rounds

Regarding the use of the maximum detected groundwater contaminant levels in the risk assessment, Region 5 guidance, *Future Residential Land Use Groundwater Exposure Point Concentrations for the Baseline Risk Assessment*, May 19, 1991, recommends that the contaminant concentration used to calculate the reasonable maximum exposure should be the concentration at the center of the contaminant plume, which is assumed to be the location

presenting the highest risk to the receptor. When good monitoring well data exists, the exposure point concentration should be the upper 95 percent confidence limit on the arithmetic mean of the contaminant concentrations found in at least three monitoring wells located at the center of the aquifer's contaminant plume. The guidance further states that *"If good data identifying the center of the contaminant plume do not exist, modeling is not performed, and the collection of additional samples [from additional wells] is precluded, generally the well with the overall highest concentration of contaminants of concern should be used as the exposure point concentration. This is reasonable and does not constitute the worst case risk because it is highly likely that under these conditions, the true highest contaminant concentrations have not been detected in sampling."*

It is unknown whether the monitoring wells have been located in such a manner that the center of the contaminant plume has been located. The wells sampled in the SSI/SCR are identical to those designated in the *Work Plan for Supplemental Site Characterization and Access Controls at the Himco Landfill NPL Site, Elkhart, Indiana*, prepared by QST Environmental and submitted to EPA in January 1998 by the Bayer Corporation, and no additional wells were available to identify the center of the contaminant plume in the SSI/SCR. The Work Plan, Section 2.3 Groundwater Monitoring, specified that *"New well MW119A and existing wells WT116A, MW114A and MW101A will be sampled to obtain supplemental data regarding the quality of shallow groundwater downgradient [south and southeast] of the landfill."* However, EPA also compared the maximum monitoring well contaminant concentrations with maximum background well concentrations, considering those wells similar in depth to the monitoring wells identified above. Contaminant concentrations in monitoring wells were found to be several times higher than concentrations in background wells.

Regarding the comment by ARCADIS on the lack of reporting of minimum and mean groundwater contaminant concentrations, EPA notes that all results from all sampling rounds in all monitoring wells are presented in Appendix H of the SSI/SCR.

(b) ARCADIS has commented that in the evaluation of the risks from exposure to CDA soils, the human health risk assessment (HHRA) included chemicals which were not detected in the soil in an individual parcel in the calculation of risks for that parcel. The commenters specifically refer to the risk calculations for PAHs in Parcel S, stating that the risks due to benzo(a)pyrene in Parcel S is based on non-detects. EPA does not understand the basis of this comment. As explained in Section 9.5.1.2 of the SSI/SCR, the USACE Omaha District conducted a geostatistical analysis on arsenic and benzo(a)pyrene to derive concentrations of these contaminants for un-sampled parcels; the analysis is shown in Appendix L. However, all six PAHs which EPA included in their analyte list were detected in surface soil in Parcel S, and at greater concentrations at the zero to two feet depth. In general, the concentrations in the top six inches of soil from the 1998 soil sampling, reported in Table 6-1 of the SSI/SCR, were used in the risk calculations reported in Appendix K for the Parcel S surface soil. In parcels for which geostatistical analysis (kreiging) was conducted and a contaminant concentration could be developed, for example in Parcel T, the values were used in the risk calculations. In some parcels which were sampled and the PAH concentrations were non-detect, for example in Parcel M, the concentrations at one-half the detection limit were used in the calculations because the detection limits exceeded the 1×10^{-6} screening level of 62ug/kg for benzo(a)pyrene by nearly an order of magnitude.

recommendations for this parameter. Because no standard default RME factors are available for this parameter, appropriate exposure values from the 1997 Updated Exposure Factors Handbooks were used for this activity.

(c) ARCADIS has commented that EPA used soil ingestion rates of 100mg/day for the resident exposure and 480 mg/day for the construction worker and gardener; ARCADIS believe that these values are inappropriate. EPA notes that the OSWER Directive 9285.6-03 "*Human Health Evaluation Manual, Supplemental Guidance: 'Standard Default Exposure Factors'*" is still the Agency guidance, and will remain so until replaced. The guidance suggests the use of 100mg/day as the default residential adult soil and dust ingestion rate for the RME scenario, and has been retained as the default for the standard residential exposure in EPA guidance *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*, OSWER 9355.4-24, December 2002. The guidance also suggests the use of 480mg/day for contact-intense soil exposure; however, the later value has been revised to 330mg/day since the SSI/SCR was undertaken. EPA also notes that the agricultural exposure, referred to by ARCADIS in their discussion of this issue, pertains to the average farm family exposure during all exposure activities, rather than activities related to contact-intense soil exposure alone. As the purpose of including this activity in the adult scenario was to evaluate the risk of contact-intense soil exposure activities such as gardening for a limited exposure time (40 days), the farm family exposure value was not considered appropriate for this evaluation. Further, EPA Region 5 does not use Massachusetts Department of Environmental Protection default exposure factors in their Superfund risk assessments; however, EPA does use a soil ingestion rate of 100mg/day for the construction workers' scenario to represent the CTE scenario, and has used this value in the Adult Lead Model as the CTE value.

(d) ARCADIS has commented that the SSI/SCR risk assessment has double-counted the risk to the residential gardener by summing across scenario pathways . . . specifically including the standard residential and the gardening scenarios additively in the estimate. However, EPA notes that it is common risk assessment practice to assume that the contact-intense soil activities occur in addition to the standard exposure which does not include these activities, and moreover, to assume that the scenarios are additive, as the gardening activities do not encompass the entire waking period of the receptor's day. The use of the standard input values to account for the exposure which occurs during these remaining hours (the greater portion of the day) was thus determined to be appropriate in this risk assessment.

(e) ARCADIS has commented on the methodology used to evaluate the inhalation of VOCs from groundwater in the residential exposure, and has suggested that several inputs used in the risk assessment were inappropriate. EPA does acknowledge that their contractor used some outdated input values in the Andelman Model calculations in the risk assessment presented in the SSI/SCR, which may have resulted in some spurious estimates of water use, even though the SSI/SCR text suggested that the estimates were done correctly. EPA Region 5 continues to support the use of standard methodologies in the preparation of human health risk assessment for Region 5 Superfund sites. EPA does not believe that these calculations change the conclusions of the risk assessment.

EPA generally relies on standard methodologies which have been evaluated by EPA's research office. At present, no validated or verified models for use in deriving indoor air concentrations

from showering and other household uses of groundwater are available, and this creates model uncertainty in the risk assessment. The Andelman equations and default input values for deriving indoor air concentrations of VOCs from showering, bathing and other household uses of groundwater, presented in Section 9.5.3.5 of the SSI/SCR, represent the standard EPA methodology for this pathway of exposure. A discussion of the Andelman model and equations are presented in Section 3.1 of EPA *Human Health Evaluation Manual, Part B* (OSWER Directive 9285.7-01B, December 13, 1991).

The bathrooms air concentrations from benzene in groundwater (using 3.0µg/L in the eastern area and 15.0µg/L in the CDA) from showering or bathing derived using the Andelman (1990) equations as reported in the Intake and Risk Calculation Spreadsheet in Appendix K of the SSI/SCR were reviewed. The derived air concentration of benzene for the combined 30-year child-adult exposure for the Eastern Area (using the adjusted exposure time of 0.31 hours) is 23.3µg/m³ (2.3×10^{-2} mg/m³); the derived air concentration for the child scenario (using an exposure time of 0.75 hours) is 56.3µg/m³ (5.6×10^{-2} mg/m³). The combined 30-year child-adult exposure for the CDA (using the adjusted exposure time of 0.31 hours) is 116µg/m³; the derived air concentration for the child scenario (using an exposure time of 0.75 hours) is 281µg/m³. These estimates do not represent unreasonable estimates of the benzene concentrations in air from these showering or bathing activities. To further evaluate the representativeness of these estimates, EPA requested that the Eastern Area benzene air concentrations from adult showering be calculated using other available models being evaluated by EPA's Headquarter contractors. The benzene air estimates from three models: Schaum and Andelman (used by Region 2), the Foster & Chrostowski (called IHEM) and McKone (CalTox) were employed for a 12 minute showering scenario using standard defaults for all other inputs; each model uses a different set of exposure variables so the models are not directly comparable. The calculated benzene air concentrations for the showering scenario, derived from each model, respectively, were 25.0µg/m³, 40.0µg/m³ and 90.0µg/m³. Thus it appears that the values used in the risk assessment in the SSI/SCR likely represent under estimates of the VOC air concentrations, as these newer methodologies would have yielded more conservative estimates of the indoor air concentration of VOCs released during the showering or bathing periods considered by EPA in the SSI/SCR risk assessment. However, the showering exposure represents only a portion of the total daily exposure due to VOCs, and the showering/bathing time is short in comparison to the total daily exposure to VOCs in indoor air.

(f) ARCADIS has commented that the default house volume used in the Andelman equations for deriving indoor air concentrations of VOCs from other household uses of groundwater are too low, and that values from the 1997 Updated Exposure Factors Handbook should have been used instead. However, EPA notes that standard default input values are included in the Andelman Model, and thus considers these values appropriate inputs in the Andelman Model calculations unless site-specific data on the residential house volumes is available.

Comment 4, page 2.: The identified parties have commented: *"There is an unexplained discrepancy between the projected costs for wells located south of the Landfill and those located east of the Landfill in materials that address EPA's proposed amendments to the ROD."*

EPA's Response: EPA does not agree with this comment.

Comment 5, page 3: The identified parties have commented: *"The process by which EPA has made its determination regarding the proposed amendments to the ROD have not been adequately explained. Nor have EPA's determinations of the proposed costs associated with the remedial action EPA now proposes to be undertaken at the Site been adequately explained. Accordingly, having decided that it is appropriate to reconsider remedial action for the Site selected in the ROD, EPA should conduct a complete and thorough feasibility study of the remedial action alternatives suggested by the complete technical data set for this Site that now exists."*

EPA's Response: EPA does not agree with this comment.

Response to Comments by the citizens of Elkhart on EPA's 2003 Proposed Plan Himco Superfund Site

A Commenter wrote: "The proposed plan to clean up the soil and stop the dangerous water from being used sounds sensible to me. I am for it."

EPA's Response: Comment duly noted.

A Commenter wrote: "Why is such a shallow cap being installed?"

EPA's Response: The 1992 Remedial Investigation report suggested that the landfill has no associated risk outside of EPA's unacceptable risk range of 1×10^{-6} to 1×10^{-4} for the landfill soil at Himco Dump. The 1992 soil sampling did not fully characterize the landfill, but was used to screen the landfill. A cover will be placed over the landfill to eliminate the ability for any one to come into direct contact with the landfill waste mass, and to support the newly planted vegetation. Thirty inches of soil was selected as an appropriate depth to close the landfill per closure requirements for municipal landfills.

The final cover could be more or less than the proposed 30-inches. During the remedial design phase of this project, the appropriate cover thickness will be determined based on the studies performed at that time.

A Commenter wrote: "There are three residential properties located on County Road 10 southwest of the site, in close proximity to the homes that were impacted that were never hooked up to the municipal water supply. I believe these homes should be allowed connection to the municipal water supplies to end any uncertainty as to the potential spread of groundwater contaminants in a southern or southwesterly direction. Varied reports had previously indicated that generalized groundwater flow could move to the south or southwest. No other homes are in the near vicinity thus ending speculation as to potential exposures from ground water in that area if these connections are made."

EPA's Response: Comment duly noted. EPA has tried to identify the three homes in question without success. This request will be addressed again during the remedial design phase of the project. The owner's address and telephone number needs to be identified, EPA has made several attempts to contact the residents living on County Road 10, no response has been provided. Other attempts will be made to identify the home owners.

A Commenter wrote: Homes that are connected to the city water should not be burdened with excessive water bills by the municipality. An agreement should be reached with the City of Elkhart to charge an equitable fee for water usage. A previous template may have been created when municipal water was extended to the Conrail Superfund Site, which is also in Elkhart.

EPA's Response: Comment duly noted.

Elkhart County Health Department (ECHD): has requested that well logs be submitted to the ECHD for all wells constructed or abandoned as part of the 2004 ROD remedy.

EPA's Response: Comment duly noted

ECHD Comments: "ECHD proposes that the PRP(s) be required to pay for non-partisan medical professionals such as Toxicologist, Oncologist, Epidemiologist or others capable of answering or researching answers to medical questions relevant to potential exposures due to the site. This could be presented in a public forum available to past and present residents of the impacted area. This panel could also receive written inquiries for a period of time as agreed upon by the PRP(s) and US EPA. This same panel or similar panel would present a seminar at Elkhart General Hospital for other medical doctors who might encounter patients from the impacted area. This would allow those medical professionals a better understanding of the exposure, short-term symptoms, long-term symptoms and the types of signs to look for over time."

EPA's Response: This request is outside of the scope of EPA's Remedial program. The Agency for Toxic Disease and Registry (ATSDR) is the Federal Agency that provides the support stated in the comment above. EPA has been in consultation with ATSDR regarding Himco Dump, and the need to provide additional support was not identified. EPA's Toxicologist has provided contact information to speak with anyone wanting more information regarding their health as it relates to Himco Dump. The Commenter's suggestion will be forwarded to ATSDR for future reference.

Proposed Plan Comment: A comment made during the Proposed Plan Public Meeting held on April 23, 2003 was: "Has anyone ever gone out with a radiation detector to survey the site?" This comment was made because the commenter found Himco Dump, Elkhart, IN listed on the internet entitled U. S. Radiation Sites, for the state of Indiana, URL: <http://prop1.org/prop1/radiated/in0rept.htm>.

EPA does not know why Himco Dump was placed on this list, or what the criterion were to be placed on the list. Based on this information and concern, EPA performed a radiation survey (March 2004) to determine if the site emitted any radioactivity. The radiation survey results did not report any radioactivity above background levels, except in a trenched area located near the southeast corner of the landfill. Two samples were collected from the trench that was dug during 2003, it is not known who dug the trench nor for what purpose. Based on the laboratory results of the two samples collected, the radioactivity detected were from the following naturally occurring radio nuclides presented in the following table:

Himco Dump, Elkhart, Indiana			
Uranium Decay Series			
Thorium-234	1.98	3.64	
Protactinium-234m	---	---	4.17
Radium-226	3.46	5.25	5.08
Lead-214	1.89	3.81	3.74
Bismuth-214	1.81	3.48	3.47
Lead-210	---	1.22	---
Thorium Decay Series			
Radium-228	0.957	1.87	1.69
Radium-224	0.559	1.47	1.53
Lead-212	0.980	1.86	1.83
Bismuth-212	0.999	1.93	1.79
Thallium-298	0.320	0.563	0.551
Thallium-208/0.36	0.889	1.56	1.53
Actinium Decay Series			
Uranium-235	0.214	0.0956	0.136
Thorium-227	----	0.148	----
Radium-223	0.0673	0.526	----
Radon-219	0.0903	0.150	0.229
Lead-211	----	0.333	----
Other Radionuclides			
Potassium-40	15.2	22.9	23.0
Cesium-137	0.0244	0.0130	0.0124

The data collected from radiation survey and the laboratory sampling suggest that Himco Dump should not be considered as a site that contains radiation that would adversely affect human health and the environment.

END OF RESPONSIVENESS SUMMARY

PART V ADMINISTRATIVE RECORD

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U.S. ENVIRONMENTAL PROTECTION AGENCY

EPA Region 5 Records Ctr.

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FOR
HIMCO DUMP
ELKHART, INDIANAORIGINAL
OCTOBER 1991

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REMOVAL ACTION

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200012

ORIGINAL
SEPTEMBER 6, 1990

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FOR
HIMCO DUMP
ELKHART, INDIANA

200074

UPDATE #1
SEPTEMBER 29, 1992

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HIMCO DUMP
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SEPTEMBER 24, 1992

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2	00/00/84	U.S. EPA	Report # SW-874, Hazardous Waste Land Treatment
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6	00/00/88	U.S. EPA	Guidance for Conducting Remedial Investigations & Feasibility Studies Under CERCLA-540/G-89/004
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ELKHART, INDIANA

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FOR
HIMCO DUMP
ELKHART, INDIANA

200074

UPDATE #1
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ADMINISTRATIVE RECORD
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UPDATE #2
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U.S. ENVIRONMENTAL PROTECTION AGENCY

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FORHIMCO DUMP
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3	12/05/95	Ballard, W., U.S. EPA	File	Conversation Record w/ Elkhart Resident re: Residential Properties within the Construction Debris Area (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	1
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**ADMINISTRATIVE RECORD
FOR
HIMCO DUMP SITE
ELKHART, ELKHART COUNTY, INDIANA**

**UPDATE #5
AUGUST 19, 2003**

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UPDATE #6
AUGUST 9, 2004

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